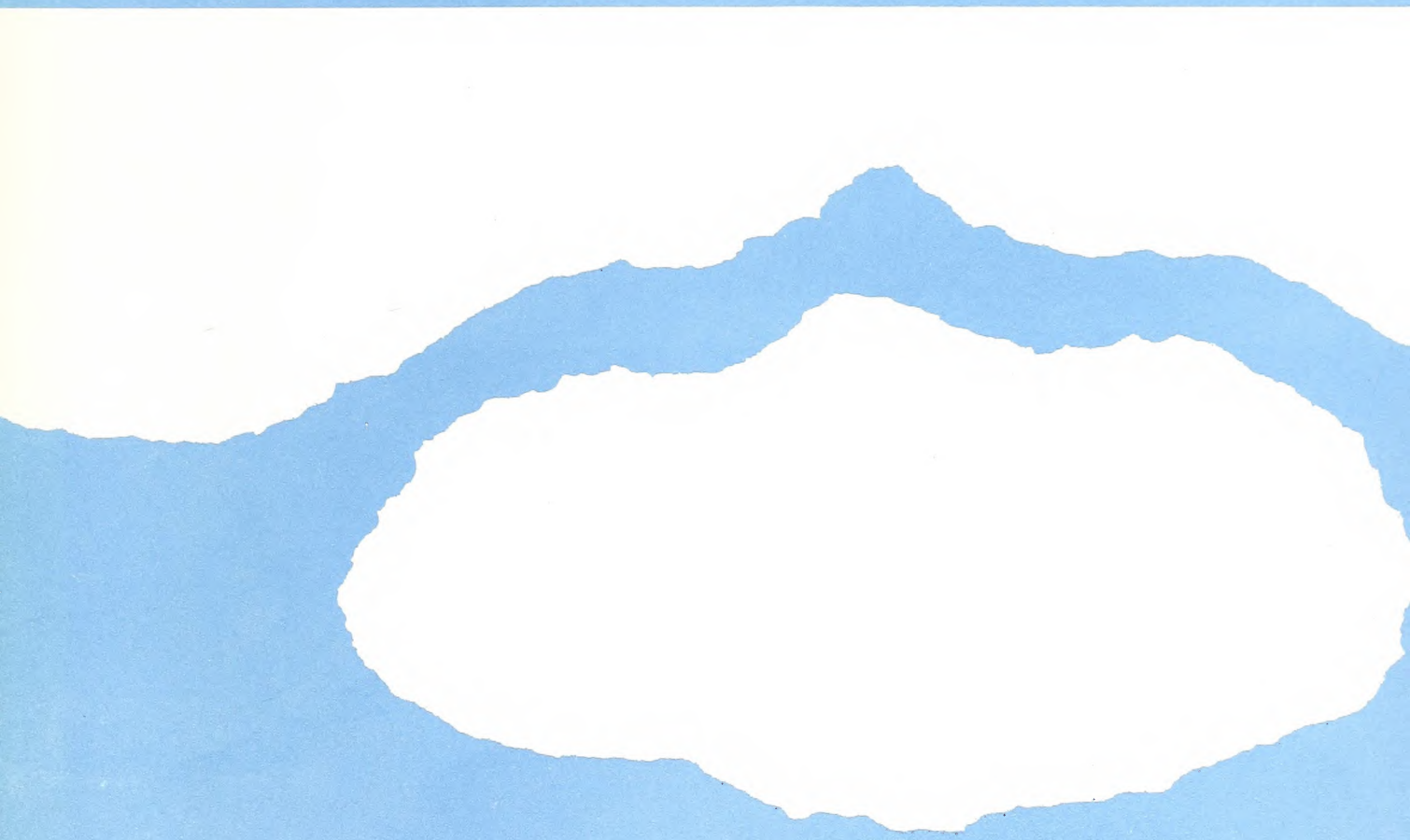
N.C. Department of Natural Resources and Community Development
Division of Environmental Management • Air Quality Section



1987 Ambient Air Quality

Published May, 1989

1987 AMBIENT AIR QUALITY

STATE OF NORTH CAROLINA
James G. Martin, Governor

DEPARTMENT OF NATURAL RESOURCES
AND COMMUNITY DEVELOPMENT
William W. Cobey, Jr., Secretary

DIVISION OF ENVIRONMENTAL MANAGEMENT
R. Paul Wilms, Director

PUBLISHED
MAY, 1989

State of North Carolina
Department of Natural Resources and Community Development
512 North Salisbury Street • Raleigh, North Carolina

James G. Martin, Governor — William W. Cobey, Jr., Secretary

May, 1989

My Fellow North Carolinians:

North Carolina faces the challenges of an environment which is beginning to "speak back"; the effects of acid rain, air toxics, urban carbon monoxide and ozone are accumulating and becoming a detriment to our quality of life. Since the quality of the air is often an "invisible" issue, we must be highly sensitive to the response of our environment which can be harmed by concentrations of air pollutants which are far below that which are noticed by the eye or nose.

The Department of Natural Resources and Community Development and four local air pollution control agencies operate highly sensitive air pollution monitoring stations at 107 strategic locations across the state to monitor North Carolina's air. Coupled with source emission data, source locations, population information, and other factors, they provide data which is used to determine the need for regulatory changes to protect our state's air quality.

This agency is dedicated to preserving and maintaining an environment that can not only tolerate our activities, but forgive our excesses.

William W. Cobey, Jr., Secretary

North Carolina Department of Natural Resources
and Community Development

FOREWORD

This report is issued by the Division of Environmental Management of the Department of Natural Resources and Community Development to inform the public of air pollution levels throughout the State of North Carolina. It presents the results of the monitoring that was conducted in 1987 to measure the outdoor concentrations of the following pollutants for which the U.S. Environmental Protection Agency and the State of North Carolina have established ambient air quality standards:

Particulate Matter	Sulfur Dioxide
Carbon Monoxide	Nitrogen Dioxide
Ozone	Lead

The data are presented graphically and as statistical summaries, including comparisons to the ambient air quality standards. The report discusses the recorded data, seasonal variability of some pollutants, and the source, and effects of each pollutant. Data and areas exceeding the ambient air quality standards are identified; factors which have contributed to those exceedances are also described.

A brief discussion of the ambient air monitoring program, including a description of the monitoring network, is provided.

Additionally, current air pollution information is available 24-hours-a-day in four areas of the state through the use of the air quality index telephone numbers. These numbers are listed below:

Charlotte	704-333-SMOG
Durham	919-733-DATA
Fayetteville	919-486-9413
Raleigh	919-733-DATA

Additional copies of this report and the previous reports are available from:

Air Quality Section
Division of Environmental Management
Department of Natural Resources and Community Development
Post Office Box 27687
512 North Salisbury Street
Raleigh, North Carolina 27611

Comments regarding this report or suggestions for improving future reports are welcomed.

R. Paul Wilms, Director
Division of Environmental Management

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Executive Summary

Ambient air monitoring is performed by the North Carolina Division of Environmental Management (DEM) and four local air pollution agencies. A listing of these agencies is provided in Appendix A.

A total of 272,956 air quality measurements were made in 1987 for five of the six criteria pollutants. Data summaries, graphs, maps, and discussions of the reported data, as well as a description of each pollutant, are presented.

Particulate Matter

During 1987, two types of particulate matter were collected in North Carolina. One type, **Total Suspended Particulate (TSP)**, includes particles in a size range of 0.3 micrometers to about 45 micrometers. The other type of particulate matter, **Particulate Matter - 10 micrometers (PM-10)**, includes particles in a size range of 0.3 micrometers to 10 micrometers (aerodynamic diameter). A micrometer is approximately 1/25000 of an inch.

There were 25 exceedances of the State TSP ambient air quality standard (150 mg/m^3). Of these, 22 were affected by exceptional events including pollen, sandblasting, construction activities, and forest fires. The remaining three exceedances were at different locations, and thus were not violations of the TSP ambient air quality standard. One of these exceedances occurred at Morehead City during the Labor Day weekend. Increased traffic and direct winds from a nearby source contributed to the exceedance. The other exceedances occurred in Charlotte in areas where long-term construction projects were ongoing. Such long-term construction projects are not considered exceptional events.

On July 31, 1987, the Federal Environmental Protection Agency (EPA) replaced the national TSP ambient air quality standard with a national standard for PM-10. There were 10 sites that collected PM-10 data in 1987. Of the 485 samples collected there were no exceedances of the new PM-10 National Ambient Air Quality Standard. Based upon the average PM-10 to TSP ratio, there is a likelihood that seven of the TSP sites will exceed the PM-10 annual standard if PM-10 monitors were installed. More PM-10 monitoring is needed to determine if a PM-10 problem exists.

Carbon Monoxide

Carbon monoxide (CO) is the most abundant air pollutant in North Carolina. More than 80 percent of the CO is believed to be emitted by motor vehicles. The most likely areas to have excessive CO concentrations are the larger cities where there are more cars and sometimes congested city streets.

In Charlotte, no exceedances were reported in 1987. The motor vehicle Inspection and Maintenance program, which has been in operation in Mecklenburg County since December 1982, deserves some of the credit for this CO improvement.

Excessive CO readings continue to be reported in Wake and Durham County. There were a total of five CO exceedances in the Raleigh and Durham areas in 1987. This is much improved when compared to a total of 45, 8-hour CO averages above the ambient air quality standard reported in 1986. Newer cars in the vehicle fleet, traffic control strategies, and a Wake County Inspection and Maintenance program have decreased the number and size of exceedances. These control measures, coupled with fewer periods of stagnant air in the fall of 1987, have given the appearance of improvement in the CO problem in these areas. More air quality data will be needed to confirm this improvement.

Ozone

Ozone (O_3) is formed by numerous chemical reactions that take place in the atmosphere in the presence of sunlight. Hydrocarbons and nitrogen dioxide are important reactants in the formation of ozone; therefore, the main emphasis in the control of ozone is to control the emissions of hydrocarbons.

To date, only Mecklenburg County has been designated as an ozone nonattainment area. At three Mecklenburg County ozone monitoring sites, there were a total of nine values exceeding the ambient air quality standard. More strict hydrocarbon control strategies

are being used in Mecklenburg County to reduce these ozone problems. Three exceedances at the Butner O_3 site in 1987 and one exceedance in 1986 establish the need for the development of ozone control strategies in the Raleigh and Durham areas. Several other areas of the state are very close to exceeding the ambient air quality standard for ozone. In 1987, Winston Salem, Fayetteville and Wake Forest monitors reported one exceedance each. These areas, as well as several others, are being carefully watched. The new 1988 data indicates that ozone control strategies will be called for in 19 counties. **Ozone has become the most widespread and most serious criteria air pollutant problem in North Carolina.**

Sulfur Dioxide

No 1987 **sulfur dioxide (SO_2)** ambient concentrations have been measured above the ambient air quality standard at state and local agency monitoring sites. The sites measuring the highest concentrations are near major sulfur dioxide sources such as those burning large quantities of fossil fuels and those manufacturing sulfuric acid. Remote and rural SO_2 concentrations are very low, frequently near the lower measurement capability of the monitors. SO_2 data continues to be collected to provide data to aid new and expanding industry in the permitting process.

Nitrogen Dioxide

Nitrogen oxides are emitted into the atmosphere as a result of the burning of fuels by both stationary sources and motor vehicles. These nitrogen oxides, particularly nitric oxide, convert to nitrogen dioxide in the atmosphere. In 1987, only limited ambient air monitoring for **nitrogen dioxide (NO_2)** was performed. Two sites were operated in Winston Salem for the entire year. No exceedances of the nitrogen dioxide ambient air quality standard have been measured at these sites or at other sites in recent years. More NO_2 monitoring will begin in 1989 as a part of data gathering for development of control strategies for ozone nonattainment areas.

Lead

Lead (Pb) analysis is performed routinely at five North Carolina TSP sites. There have been no exceedances of the lead ambient air quality standard in recent years. The ambient air lead concentrations continue to drop due to a continued decrease in the use of leaded fuels, which is the most significant source of airborne lead in North Carolina.

I. AMBIENT AIR QUALITY STANDARDS

Air quality progress is measured by comparing ambient air quality measurements to the appropriate standard. The "ambient air" is defined by the Environmental Protection Agency (EPA) regulations as "that portion of the atmosphere, external to buildings, to which the general public has access." The ambient air quality standards are classified as primary standards, secondary standards, or both. The primary standards were established allowing an adequate margin of safety for protection of public health. Secondary standards were established with an adequate margin of safety to protect the public welfare from adverse effects associated with pollutants in the ambient air. In protecting public welfare, air pollution effects on the following are considered: soils, water, crops, vegetation, man-made materials, animals, wildlife, weather, visibility, climate, property, transportation, the economy, personal comfort, and well-being. The scientific criteria upon which the standards are based are periodically reviewed by EPA, and the standards are re-established or changed based upon the findings. The national primary and secondary standards and the North Carolina ambient air quality standards are summarized in Table I. Brief descriptions of air pollutants for which ambient air quality standards exist are included in Section III of this report.

TABLE I: Summary Of National And N.C. Ambient Air Quality Standards

POLLUTANT	TIME OF AVG.	NAT. PRIM. STD	NAT. SEC. STD	N.C. STD
TSP [a]	Ann. Geo. Mean	75 mg/m^3	None	75 mg/m^3
	24 Hour[b]	260 mg/m^3	150 mg/m^3	150 mg/m^3
PM-10	Ann. Arith. Mean [a]	50 mg/m^3[a]	Same as prim.[a]	50 mg/m^3[a]
	24 Hour [a,c]	150 mg/m^3[a]	Same as prim.[a]	150 mg/m^3[a]
SO_2	Ann. Arith. Mean	80 mg/m^3	None	80 mg/m^3
	24 Hour [b]	365 mg/m^3	None	365 mg/m^3
	3 Hour [b]	None	1300 mg/m^3	1300 mg/m^3
NO_2	Ann. Arith. Mean	.053 ppm	Same as prim.	.053 ppm
CO	8 Hour [b]	9 ppm	None	9 ppm
	1 Hour [b]	35 ppm	None	35 ppm
O_3	1 Hour [c]	0.12 ppm	Same as prim.	0.12 ppm
Pb	Quarterly Arith. Mean [b]	1.5 mg/m^3	Same as prim.	1.5 mg/m^3

a. The National Total Suspended Particulate (TSP) standards were replaced by a National Particulate Matter-10 micrometer, aerodynamic diameter, (PM-10) standards on 7-31-87 by EPA. The North Carolina PM-10 standard is effective July 1, 1988.

b. Not to be exceeded more than once per year.

c. Not to be exceeded on more than an average of one day per year. (Four days with an exceedance at a site in three years or less is a violation.)

mg/m^3 - micrograms per cubic meter of air
ppm - parts per million
microgram - one millionth of a gram, where 454 grams = 1 pound

II. 1987 AMBIENT AIR QUALITY DATA

There are many factors that affect the quality of air in an area. Air quality is a function of meteorological conditions as well as location and size of pollution sources. The speed and direction of air movement determine whether pollutant emissions cause exceedances of the ambient air quality standards and where those exceedances exist. Other meteorological factors that affect pollutant concentrations include atmospheric stability, precipitation, solar radiation and temperature. Geographic factors that affect concentrations include variables such as whether an area is urban or rural, or has mountains, valleys or plains. Economic factors that are important include concentration of industries, boom or recession, weekday or weekend. All of these variations may affect air pollution patterns either on a short-term or long-term basis.

Air quality may also be influenced by an "exceptional event." Such an event may be natural or man-made and may cause the data to be biased. Most high data and all exceedances are examined to detect "exceptional events" and to avoid misuse or misinterpretation of the data. All valid data, whether "exceptional events" or not, are included in these data summaries. Data known to have been affected by exceptional events are not included in the figures and graphs. A listing of typical exceptional events is given in Appendix B.

Ambient Data

There were 124 air pollutant monitors operated by state or local agencies in North Carolina in 1987.* A summary of the valid 1987 ambient air quality data collected is presented following a discussion of the data. To save operating costs, the monitor operations at some sites are suspended for two years and operated on the third year. For those monitors not operating during 1987, data for the most recent sampling year (1986 or 1985) are included in this report.

*A listing of these agencies is provided in Appendix A.

II. A. **Particulate Matter - Total Suspended Particulate**

Total Suspended Particulate (TSP) matter is collected using high volume samplers and a gravimetric analysis procedure (EPA Reference Method) by the state and four local program agencies. There were 75 network sites measuring TSP in 1987 across the state. A total of 4213 TSP samples were collected. A summary of these data appears in Table II.

Of these, 25 samples exceeded the ambient air quality standards. This compares to 37 samples which exceeded the standard in 1986. Many of these exceedances were affected by exceptional events. Microscopic analysis, wind data, and reports of events near the sites are used to identify and confirm data affected by exceptional events.

Forest fires occurring in Tennessee, Kentucky, Virginia, and West Virginia were the cause for the greatest number of exceedances in 1987. These exceedances occurred on November 5, 1987 when wind conditions moved the massive plumes from these fires into the state. Local program agencies and regional offices reported many air pollution complaints during this period. Dust from construction activities was the second greatest cause for exceedances during 1987. Other exceptional events which affected samples were sandblasting of nearby structures, and naturally occurring pollen. Pollen biases are considered exceptional events, and are not used to determine an area's attainment status with the ambient air quality standards.

TSP exceedances which have not been identified as affected by exceptional events occurred at Morehead City on September 6, 1987 and in Charlotte on January 3, 1987 and February 14, 1987. The Morehead City exceedance (164 mg/m^3) occurred on Labor Day weekend. Increased traffic during the holiday period and direct winds from a nearby source contributed to the exceedance. The source was advised of the exceedance and asked to take preventive actions. The Charlotte January exceedance (164 mg/m^3) occurred at the Trade Street site in an area where building construction continued for many months. The Charlotte February exceedance (158 mg/m^3) occurred at the Community Hospital site in an area where a long-term roadway construction project was ongoing. Emissions from these projects contributed to the exceedances. Long-term construction projects are not considered exceptional events. A listing of all exceedances and a comment about each exceedance is given in Table III.

The second highest 24-hour measurement, not affected by an exceptional event, is compared to the ambient air quality standard to determine attainment status. Figure 1 presents these second high values with the data affected by exceptional events excluded for each county monitored. Since no sites measured two nonbiased valid exceedances, there are no sites violating the 24 hour TSP ambient air quality standard in the state and **all areas of the state are considered to be attaining the state ambient air quality standards for total suspended particulate**.

The annual geometric mean is also compared to the annual ambient air quality standard to determine attainment status. There are no sites violating the state annual TSP ambient air quality standard. Figure 2 presents the highest annual geometric mean for each county monitored.

TABLE II: Total Suspended Particulates [A] In Micrograms Per Cubic Meter (mg/m^3) For 1987

SITE NUMBER	COUNTY	CITY	ADDRESS	NUM OBS	24-HOUR MAXIMA 1ST	2ND	3RD	ARITH MEAN	GEO MEAN	GEO STD	EXCEEDANCES PRIMARY[B] #>260	PRIMARY[B] GM>75	SECONDARY[B] #>150
37-001-0001	Alamance	Burlington	1136 E. Webb Ave.	58	117	84	84	51	46	1.5			
37-003-0003	Alexander	Taylorsville	Sr 1107 & 1117	60	201	167	147	48	40	1.8			2
37-013-1003	Beaufort	Washington	400 E. Third St.	60	81	73	64	41	39	1.5			
37-021-0003	Buncombe	Asheville	Health & Social Services Bldg	61	72	70	69	42	38	1.6			
37-021-0025	Buncombe	Regional Airport	I-26 S	51	114	95	87	45	39	1.7			
37-021-0026	Buncombe	Grovestone	WNC Shopping Center	57	99	90	90	47	43	1.6			
37-021-0027	Buncombe	Candler	US 19-23	58	78	77	77	48	43	1.7			
37-025-0004	Cabarrus	Kannapolis	Floyd St.	57	101	93	85	53	49	1.5			
37-027-0003	Caldwell	Lenoir	Hwy 321 N.	58	88	84	81	44	39	1.7			
37-031-0003	Carteret	Morehead City	Arendell & 4th Streets	59	164	100	93	53	48	1.6			1
37-035-0004	Catawba	Hickory	1650 First St.	55	208	128	112	69	63	1.6			1
37-037-0003	Chatham	Moncure	SR 1011	47	97	80	71	44	41	1.4			
37-047-0001	Columbus	Acme Delco	SR 1878	55	110	82	80	40	37	1.5			
37-051-0004	Cumberland	Fayetteville	Fire Sta. 5, 3296 Village Dr.	61	133	98	87	50	47	1.4			
37-057-0002	Davidson	Lexington	S. Salisbury St.	54	116	95	88	54	50	1.5			
37-057-1001	Davidson	Thomasville	City Hall, 7 West Guilford St.	57	130	112	105	58	53	1.5			
37-063-0001	Durham	Durham	Health Dept, 300 E Main St.	45	114	97	78	50	46	1.6			
37-065-0002	Edgecombe	Rocky Mount	Legett Rd., Waste Treatment	48	223	216	182	80	69	1.8			3
37-067-0001	Forsyth	Walkertown	Grubbs Road	57	128	84	72	42	37	1.6			
37-067-0004	Forsyth	Winston Salem	Old Walkertown Rd., Pi School	57	121	96	80	39	35	1.7			
37-067-0009	Forsyth	Winston Salem	Indiana Ave. & Akron Dr.	60	168	108	105	61	56	1.5			1
37-067-0013	Forsyth	Winston Salem	720 Ridge Avenue	53	164	101	97	57	53	1.5			1
37-067-0014	Forsyth	Winston Salem	Stadium Drive	60	130	86	77	49	45	1.5			
37-067-0015	Forsyth	Winston Salem	Hutton Street	61	114	88	82	47	44	1.5			
37-067-0017	Forsyth	Winston Salem	Fairchild Rd.	36	75	75	74	48	45	1.4			

(A) This Table includes all valid TSP data, including those affected by exceptional events.

(B) A more detailed listing of exceedances is given in Table III.

(TABLE II: Continued Next Page)

TABLE II: Total Suapended Particulates [A] In Micrograma Per Cubic Meter (mg/m^3) For 1987

SITE NUMBER	COUNTY	CITY	ADDRESS	NUM OBS	24-HOUR MAXIMA 1ST	2ND	3RD	ARITH MEAN	GEO MEAN	GEO STD	EXCEEDANCES PRIMARY[B] #>260	PRIMARY[B] GM>75	SECONDARY[B] #>150
37-067-0020	Forsyth	Winston Salem	Silas Creek Pkwy At Hawthorn	60	108	107	86	46	42	1.5			
37-067-0021	Forsyth	Winston Salem	Sixth & Broad St, Friends Ch	61	127	100	93	46	42	1.5			
37-067-1001	Forsyth	Kernersville	Bodenheimer St.	59	152	133	108	57	52	1.5			1
37-071-0014	Gaston	Gastonia	Rankin Lake Rd.	53	76	71	65	41	38	1.6			
37-081-0004	Guilford	High Point	650 Francis St.	55	146	79	79	41	36	1.6			
37-081-0009	Guilford	Greensboro	Edgeworth & Bellemeade St.	61	125	95	81	45	40	1.6			
37-081-0010	Guilford	Greensboro	1305 Merritt Dr.	59	163	98	98	54	49	1.6			1
37-081-0012	Guilford	Greensboro	Western Guilford High School	57	104	88	78	45	40	1.6			
37-081-1003	Guilford	High Point	National Guard Armory	60	113	101	86	49	44	1.6			
37-081-1005	Guilford	High Point	E Green & S Centennial St.	57	168	111	100	60	55	1.5			1
37-083-0002	Halifax	Roanoke Rapids	Fifth & Carolina Streets	45	250	215	141	63	52	1.8			2
37-085-0001	Harnett	Dunn	Municipal Building	61	153	113	111	56	52	1.5			1
37-087-0002	Haywood	Canton	Roof, Canton Fire Dept	59	122	111	111	66	63	1.4			
37-087-0006	Haywood	Hazelwood	Fire Station Brown Ave.	57	114	110	105	53	49	1.5			
37-089-1005	Henderson	Hendersonville	US 25 & US 64	60	199	103	100	60	54	1.6			1
37-097-0002	Iredell	Troutman	SR 2350	60	469	288	267	58	43	2.0	3		4
37-097-2002	Iredell	Statesville	300 South Tradd St.	56	119	94	87	54	51	1.4			
37-107-0003	Lenoir	Kinston	1700 Market St.	57	70	67	60	37	35	1.5			
37-109-0002	Lincoln	Lincolnton	Jail	59	106	95	83	53	50	1.6			
37-111-0002	Mcdowell	Marion	Courthouse	61	127	107	104	62	56	1.6			
37-119-0001	Mecklenburg	Charlotte	600 E. Trade St.	60	164	137	126	58	55	1.6			1
37-119-0002	Mecklenburg	Charlotte	Community Hospital 801, S. Gr	61	158	119	119	62	57	1.5			1
37-119-0003	Mecklenburg	Charlotte	Fire Sta. #11, 620 Moretz St.	61	111	105	98	56	51	1.5			
37-119-0010	Mecklenburg	Charlotte	Fire Sta. #10, 2136 Remount Rd.	60	89	88	78	49	45	1.5			
37-119-0011	Mecklenburg	Charlotte	Co. Hlt. Dept. Roof, 1200 Blythe	61	101	86	74	44	41	1.5			

(A) This Table includes all valid TSP data, including those affected by exceptional events.

(B) A more detailed listing of exceedances is given in Table III.

(TABLE II: Continued Next Page)

TABLE II: Total Suspended Particulates [A] In Micrograms per Cubic Meter (mg/m^3) for 1987 (Continued)

SITE NUMBER	COUNTY	CITY	ADDRESS	NUM OBS	24-HOUR MAXIMA 1ST	2ND	3RD	ARITH MEAN	GEO MEAN	GEO STD	EXCEEDANCES PRIMARY[B] #>260	PRIMARY[B] GM>75	SECONDARY[B] #>150
37-119-0026	Mecklenburg	Charlotte	Woodlawn, Nations Ford Rd.	59	88	82	81	48	45	1.5			
37-119-0028	Mecklenburg	Charlotte	1501 North I-85	57	81	71	69	41	38	1.5			
37-119-0901	Mecklenburg	Charlotte	7400 Tuckasegee	27	79	67	65	33	33	1.7			
37-119-1001	Mecklenburg	Davidson	Filter Plant	60	73	62	61	35	32	1.6			
37-119-1003	Mecklenburg	Huntersville	Holbrook Road	54	117	84	77	39	35	1.6			
37-119-1005	Mecklenburg	Charlotte	400 Arrowood Blvd.	58	139	133	110	60	54	1.6			
37-119-1006	Mecklenburg	Charlotte	Neck Road, Duke Power #2	61	61	61	58	31	28	1.6			
37-119-2001	Mecklenburg	Mint Hill	Telephone Substation	60	86	73	68	40	37	1.5			
37-121-0001	Mitchell	Spruce Pine	City Hall, Summit St.	60	168	108	105	59	53	1.6			1
37-129-0005	New Hanover	Wilmington	Ninth And Orange Streets	28	100	87	77	46	42	1.5			
37-129-1002	New Hanover	Wilmington	N. Walnut St.	61	100	94	87	50	47	1.5			
37-133-0004	Onslow	Jacksonville	2553 Onslow Drive	61	106	104	92	44	41	1.5			
37-139-0001	Pasquotank	Elizabeth City	Water Plant, N. Wilson St.	58	78	74	68	38	35	1.5			
37-145-0001	Person	Roxboro	Water Plant, Chub Lake Road	53	88	82	72	36	32	1.6			
37-147-0002	Pitt	Greenville	North Plant St.	57	87	78	64	37	34	1.5			
37-151-0003	Randolph	Asheboro	1462 Winslour St.	56	110	92	85	49	44	1.6			
37-155-0003	Robeson	Lumberton	South Water St.	61	89	85	81	45	42	1.5			
37-159-1005	Rowan	Salisbury	Church St.	53	231	103	101	58	53	1.5			1
37-163-0002	Sampson	Clinton	Well #3, South Blvd.	56	169	108	69	44	40	1.6			1
37-165-0003	Scotland	Laurinburg	Waste Treatment Plant	60	85	78	73	41	39	1.5			
37-171-0002	Surry	Mount Airy	Hwy 52 S.	59	75	69	69	43	40	1.5			
37-175-0002	Transylvania	Brevard	Hwy 64	55	85	84	75	47	44	1.5			
37-183-0003	Wake	Raleigh	Fire Station #9, Six Forks Rd.	57	101	97	81	46	42	1.6			
37-187-0002	Washington	Plymouth	Old Acre Rd.	61	82	78	74	44	41	1.5			
37-191-0004	Wayne	Goldsboro	Hwy. 70 West, Patrol Station	57	116	94	94	51	47	1.5			
37-195-0002	Wilson	Wilson	Kenan St. & Tarboro St.	57	96	82	80	51	46	1.6			

(A) This Table includes all valid TSP Data, including those affected by exceptional events.

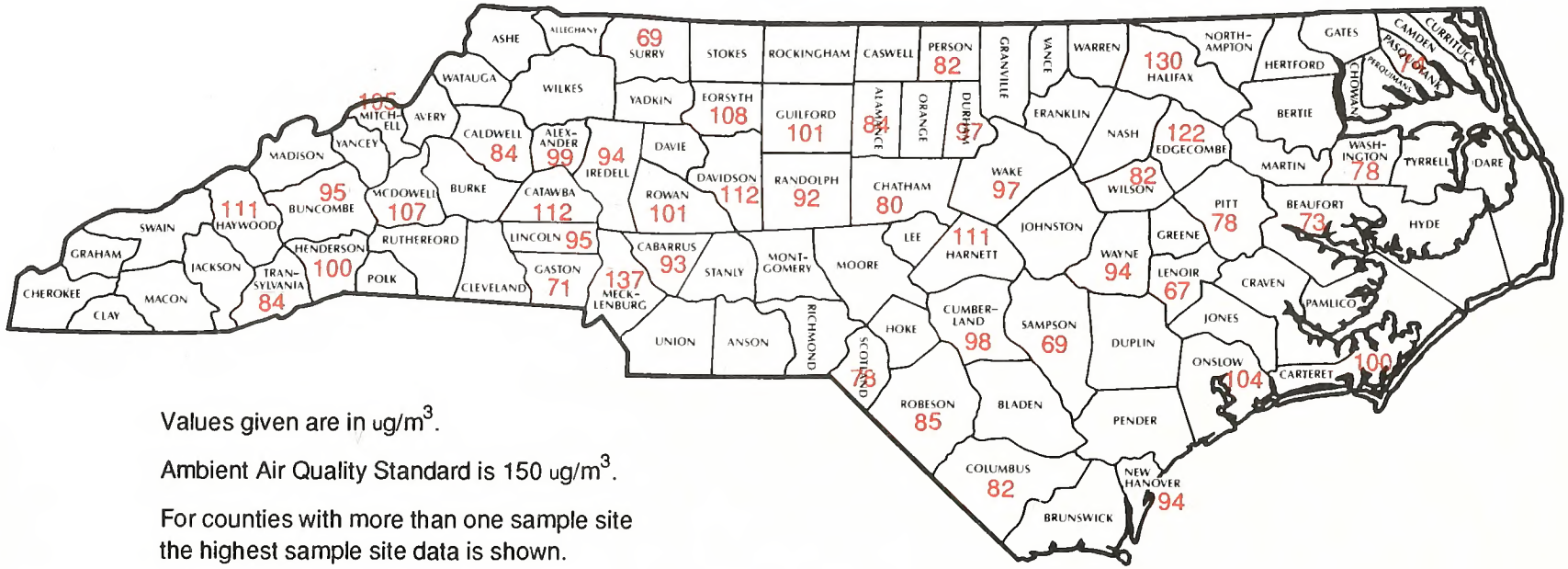
(B) A more detailed listing of exceedances is given in Table III.

TABLE III: TSP Exceedances

SITE NUMBER	SITE NAME	DATE	TSP VALUE (ug/m^3)	EXCEPTIONAL EVENT(S)
37-003-0003	Taylorsville	8-31-87	201	Construction
37-003-0003	Taylorsville	11-5-87	167	Construction & Forest Fire
37-031-0003	Morehead City	9-6-87	164	None (A)
37-035-0004	Hickory	11-5-87	208	Forest Fires
37-065-0002	Rocky Mount	4-9-87	216	Construction and Pollen
37-065-0002	Rocky Mount	9-18-87	223	Construction
37-065-0002	Rocky Mount	9-24-87	182	Construction
37-067-0009	Winston Salem, Indiana & Akron	11-5-87	168	Forest Fires
37-067-0013	Winston Salem, Ridge Ave	11-5-87	164	Forest Fires
37-067-1001	Kernersville	11-5-87	152	Forest Fires
37-081-0010	Greensboro, Merritt Drive	11-5-87	163	Forest Fires
37-081-1005	High Point, Green & Centennial	11-5-87	168	Forest Fires
37-083-0002	Roanoke Rapids	2-20-87	250	Construction
37-083-0002	Roanoke Rapids	2-26-87	215	Construction
37-085-0001	Dunn	11-5-87	153	Forest Fires
37-089-1005	Hendersonville	11-5-87	199	Forest Fires
37-097-0002	Troutman	4-21-87	159	Sandblasting
37-097-0002	Troutman	5-3-87	288	Sandblasting
37-097-0002	Troutman	5-9-87	267	Sandblasting
37-097-0002	Troutman	10-12-87	469	Sandblasting
37-119-0001	Charlotte, Trade Street	1-3-87	164	None (A)
37-119-0002	Charlotte, Community Hospital	2-14-87	158	None (A)
37-121-0001	Spruce Pine	11-5-87	168	Forest Fires
37-159-1005	Salisbury	11-5-87	231	Sandblasting & Forest Fire
37-163-0002	Clinton	11-5-87	169	Forest Fires

(A) These samples were valid exceedances of the ambient air quality standard, but since a second exceedance was not measured at any of these sites, no violation occurred.

FIGURE 1
TOTAL SUSPENDED PARTICULATE
1987 Second Highest 24-Hour Averages*



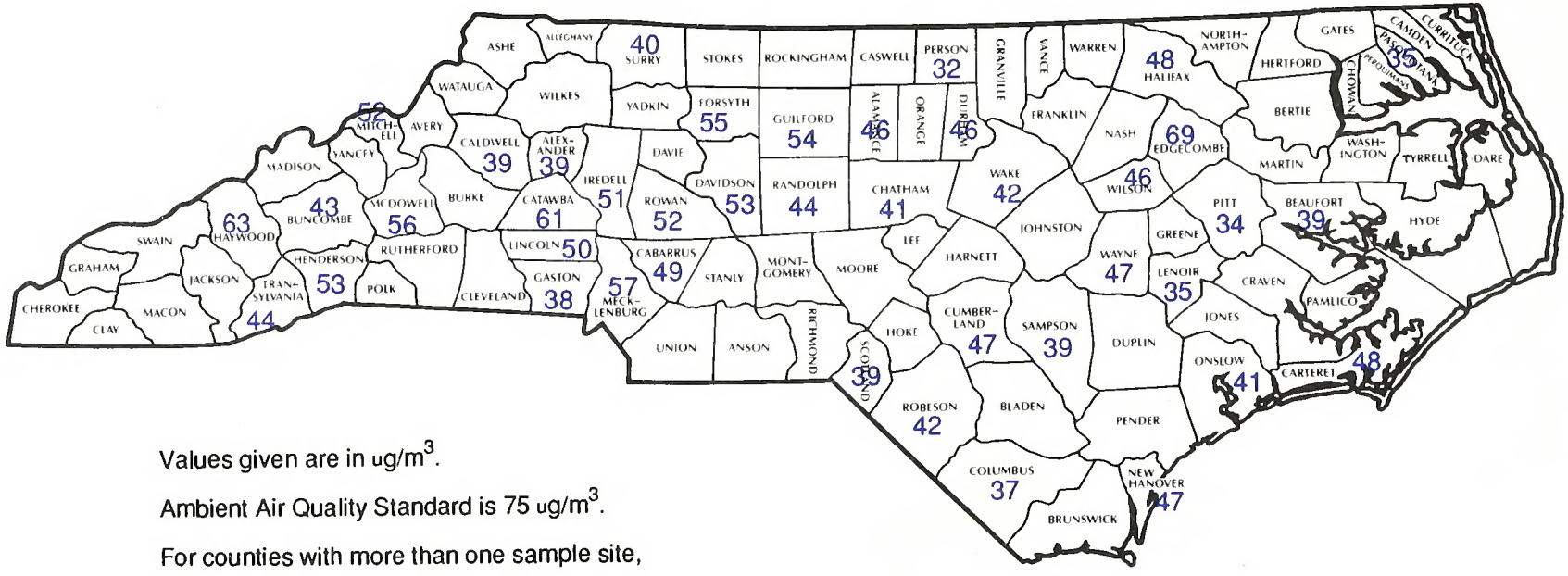
Values given are in ug/m^3.

Ambient Air Quality Standard is 150 ug/m^3.

For counties with more than one sample site the highest sample site data is shown.

*Data known to have been affected by exceptional events are not included in this figure.

FIGURE 2
TOTAL SUSPENDED PARTICULATE
1987 Annual Geometric Means*



Values given are in ug/m^3.

Ambient Air Quality Standard is 75 ug/m^3.

For counties with more than one sample site, the highest sample site data is shown.

*Data known to have been affected by exceptional events are not included in this figure.

II. B. Particulate Matter - PM-10

Particulate Matter-10 micrometers or less (PM-10) is collected using high volume samplers and size selective inlets and is analyzed using a gravimetric analysis procedure (EPA Reference Method) by the state and four local program agencies. There were ten sample sites measuring PM-10 during part of 1987. The first phase of the PM-10 statewide network was completed in mid 1987. Two more PM-10 monitors will be added in 1988 and others are planned for 1989. The PM-10 monitors have been installed in areas expected to experience PM-10 problems as indicated by complaints and TSP data. Most of these monitors are in major cities.

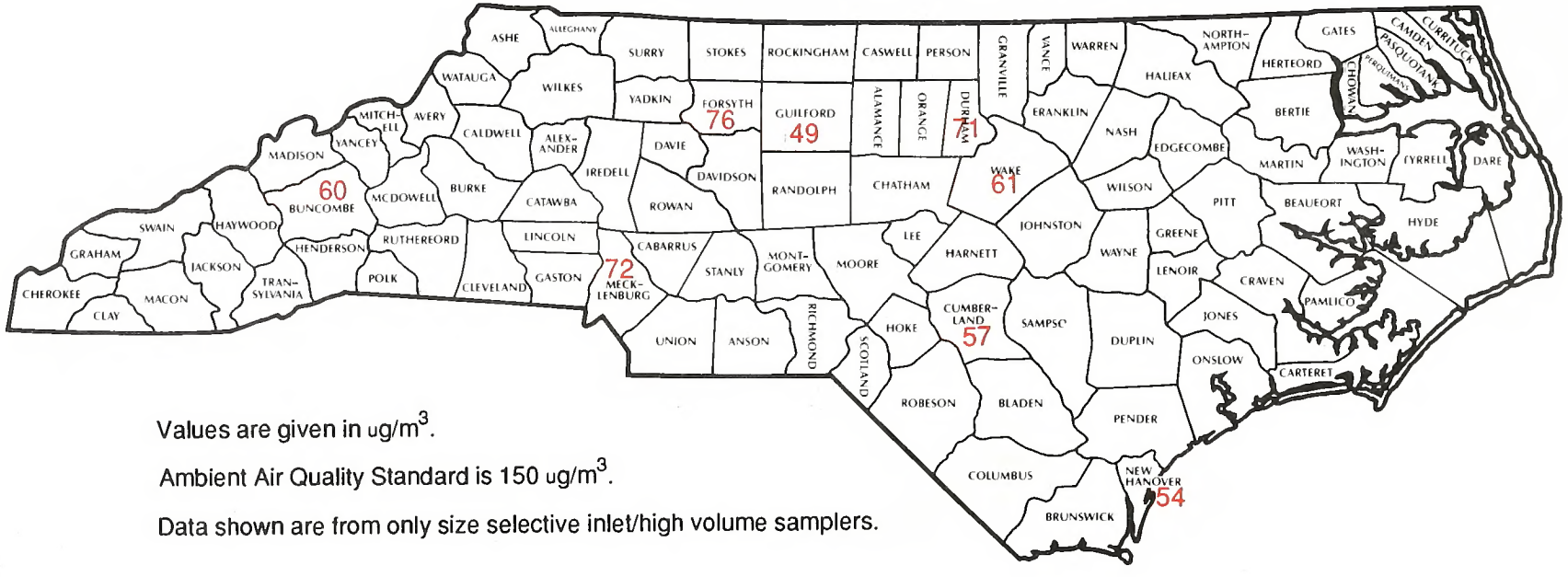
A total of 485 PM-10 samples were collected. A summary of these data appears in Table IV. **There were no PM-10 values exceeding the national ambient air quality 24-hour or annual standards (effective 7-31-87).** Figure 3 presents the second highest 24-hour values for each county monitored. The highest 24-hour value is 71 percent of the new ambient air quality standard of 150 mg/m^3. Figure 4 presents the annual arithmetic mean for each county monitored. The highest annual arithmetic mean is 80 percent of the new ambient air quality annual standard of 50 mg/m^3.

PM-10 to TSP ratios are useful in estimating PM-10 concentrations from existing TSP data. Based upon the annual arithmetic means, the PM-10 to TSP ratios vary from 47/100 to 85/100 with an average ratio of 68/100. . . meaning that generally 68 percent of the TSP collected is PM-10. At the highest of these ratios, sites having TSP annual arithmetic means above 58 mg/m^3 have a reasonable likelihood of exceeding PM-10 annual standard. In 1987 there were 7 TSP sites having annual arithmetic means above 58 mg/m^3. Due to the elevated PM-10 annual arithmetic means and the potential for PM-10 exceedances at some TSP sites, more PM-10 monitoring is needed.

TABLE IV: PM-10 In Micrograms Per Cubic Meter (ug/m^3) For 1987

				NUM	24-HOUR MAXIMA				ARITH
SITE NUMBER	COUNTY	CITY	ADDRESS	OBS	1st	2nd	3rd	4th	MEAN
37-021-0003	Buncombe	Asheville	Health & Social Services	58	60	60	55	52	31.0
37-051-0004	Cumberland	Fayetteville	Fire Sta. #5, 3296 Village Dr.	57	77	57	56	55	32.3
37-063-0001	Durham	Durham	Health Dept, 300 E Main St.	52	82	71	65	63	36.7
37-067-0009	Forsyth	Winston Salem	Indiana Ave & Akron Dr.	60	93	51	47	46	27.6
37-067-0014	Forsyth	Winston Salem	Stadium Drive	60	107	76	65	65	39.6
37-067-0020	Forsyth	Winston Salem	Silas Creek Pkwy at Hawthorn	38	59	51	45	41	26.8
37-081-0009	Guilford	Greensboro	Edgeworth & Bellemeade	29	102	49	45	44	30.9
37-119-0010	Mecklenburg	Charlotte	Fire Sta. #10, 2136 Remount Rd.	45	74	72	60	52	34.1
37-129-0005	New Hanover	Wilmington	Ninth and Orange Streets	29	74	54	50	44	32.4
37-183-0003	Wake	Raleigh	Fire Sta. #9, Six Forks Rd.	57	70	61	53	53	30.1

FIGURE 3
PM-10
1987 Second Highest 24-Hour Values

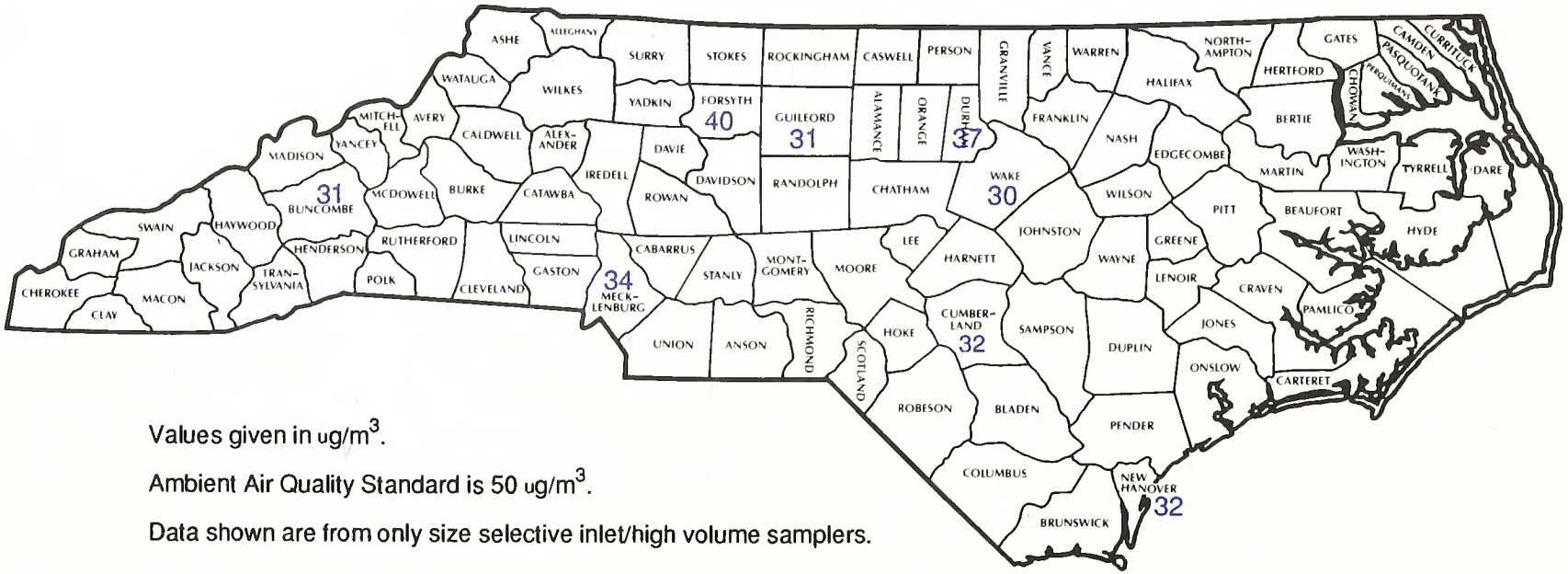


Values are given in ug/m^3.

Ambient Air Quality Standard is 150 ug/m^3.

Data shown are from only size selective inlet/high volume samplers.

FIGURE 4
PM-10
1987 Annual Arithmetic Means



Values given in ug/m^3.

Ambient Air Quality Standard is 50 ug/m^3.

Data shown are from only size selective inlet/high volume samplers.

II. C. **Carbon Monoxide**

Carbon monoxide (CO) concentrations are measured using EPA Reference or Equivalent continuous monitors in Raleigh and Durham by the state and in Forsyth and Mecklenburg counties by the two local program agencies in those counties. There were 12 carbon monoxide monitoring sites in the four major cites monitored in 1987. A total of 84,478 CO hourly measurements were made. A summary of these data appears in Table V. The second highest 1-hour CO measurement is compared to the 1-hour ambient air quality standard to determine attainment status. Figure 5 presents these second highest 1-hour CO measurements. There were no hourly periods exceeding the hourly ambient air quality standard.

The second highest 8-hour average CO value is compared to the ambient air quality standard to determine attainment status. Figure 6 presents these second highest values for each county monitored. **The 8-hour CO ambient air quality standard was exceeded a total of 5 times in 1987 in the Durham and Raleigh areas** as compared to 45 exceedances in 1986. The causes for these CO exceedances include the following: The number of vehicles traveling in nearby streets, the amount of stop and go traffic, and the existence of meteorological conditions which promote poor dispersion of the carbon monoxide. The daily patterns of highest carbon monoxide measurements further confirm these as the major causes. CO measurements are high during morning and evening "rush" hours with high measurements extending into late evening and early morning hours due to poor dispersion which frequently occurs during the night.

The reduction in the number of CO exceedances is attributable to a number of factors in Durham and Raleigh. Some of these factors are as follows: In October, November, and December, 1987 there were fewer days with stagnant air (days with average wind speeds of less than 5 miles per hour) than there were in 1986. Older, more polluting vehicles are gradually being replaced with newer and more efficient vehicles. Due to more news articles regarding air pollution, there is a greater public awareness of the problem. More people are having their vehicles maintained more often. New streets and roads, improved traffic signal coordination, and reducing onstreet parking in some areas have improved traffic flow. Additionally, in Raleigh/Wake County, a motor vehicle Inspection and Maintenance program was started in November of 1986. This program was fully operational by the fall of 1987.

TABLE V: Carbon Monoxide In Parts Per Million (PPM) For 1987

					1-HOUR		8-HOUR		EXCEEDANCES	
				NUM	MAXIMA		MAXIMA		1-hour	8-hour
SITE NUMBER	COUNTY	CITY	ADDRESS	OBS	1st	2nd	1st	2nd	#>35	#>9
37-063-0008	Durham	Durham	302 East Main St	8495	17.0	17.0	10.5	9.7		2
37-063-0010	Durham	Durham	City Park on University	7793	13.9	10.5	8.0	7.9		
37-067-0018	Forsyth	Winston Salem	301 N. Main St.	8263	15.4	12.2	7.2	5.0		
37-067-0019	Forsyth	Winston Salem	Queen Street, Miller Park	8677	8.9	8.5	6.6	6.5		
37-119-0029	Mecklenburg	Charlotte	401 South Tryon	8493	11.8	11.3	7.3	6.3		
37-119-0031	Mecklenburg	Charlotte	Park Road	8529	12.5	12.3	7.9	7.5		
37-119-0032	Mecklenburg	Charlotte	5137 Central Ave.	8388	15.7	14.1	8.5	7.6		
37-119-0034	Mecklenburg	Charlotte	Plaza Road and Lakedell	8387	14.3	13.7	6.1	5.9		
37-119-0035	Mecklenburg	Charlotte	Greenville Neighborhood Ctr	8477	10.5	9.9	8.6	7.5		
37-183-0010	Wake	Raleigh	309 S. Wilmington St.	7347	13.2	12.8	10.1	9.1		1
37-183-0011	Wake	Raleigh	420 S. Person St.	1462	13.9	13.0	9.7	9.5		2
37-183-0012	Wake	Raleigh	4307 Six Forks Road	167	5.2	4.0	2.8	1.6		

Since ambient carbon monoxide exceedances are still occurring, though at a lower frequency than in prior years, changes in the control strategies will be needed for Raleigh and Durham areas. The collection of more CO data will be useful in ensuring the success of these control strategies. Figure 7 identifies the areas not attaining the CO ambient air quality standard in recent years.

In 1986 and 1987 no CO 8-hour violations were reported in Mecklenburg County. The motor vehicle Inspection and Maintenance program, traffic flow improvements, and the gradual "turn-over" in the motor vehicle fleet to better controlled vehicles are helping to improve the air quality in Mecklenburg County.

The 1987 and historical data demonstrate that in the autumn and winter more frequent and higher CO exceedances occur than during the warmer seasons. There are several reasons for these seasonal variations:

a. In the colder months, North Carolina usually experiences more atmospheric inversions which mean a lower atmospheric "mixing height" which results in poor dispersion of air pollutants.

b. In colder months, motor vehicles emit more CO due to inefficient combustion during cold starts and warmups. Further, due to seasonal shopping, particularly in November and December, there are more cars operating in the urban areas. It is estimated that more than 80 percent of the CO found in urban areas results from motor vehicle emissions.

c. During colder temperatures, there is more fuel being burned in urban areas for comfort heating which adds to the total CO emitted into the atmosphere.

The monthly frequency of CO exceedances from all sites for both 1986 and 1987 is shown in Figure 8.

FIGURE 8. FREQUENCY OF EXCEEDANCES
OF THE 8-HOUR CARBON MONOXIDE STANDARD

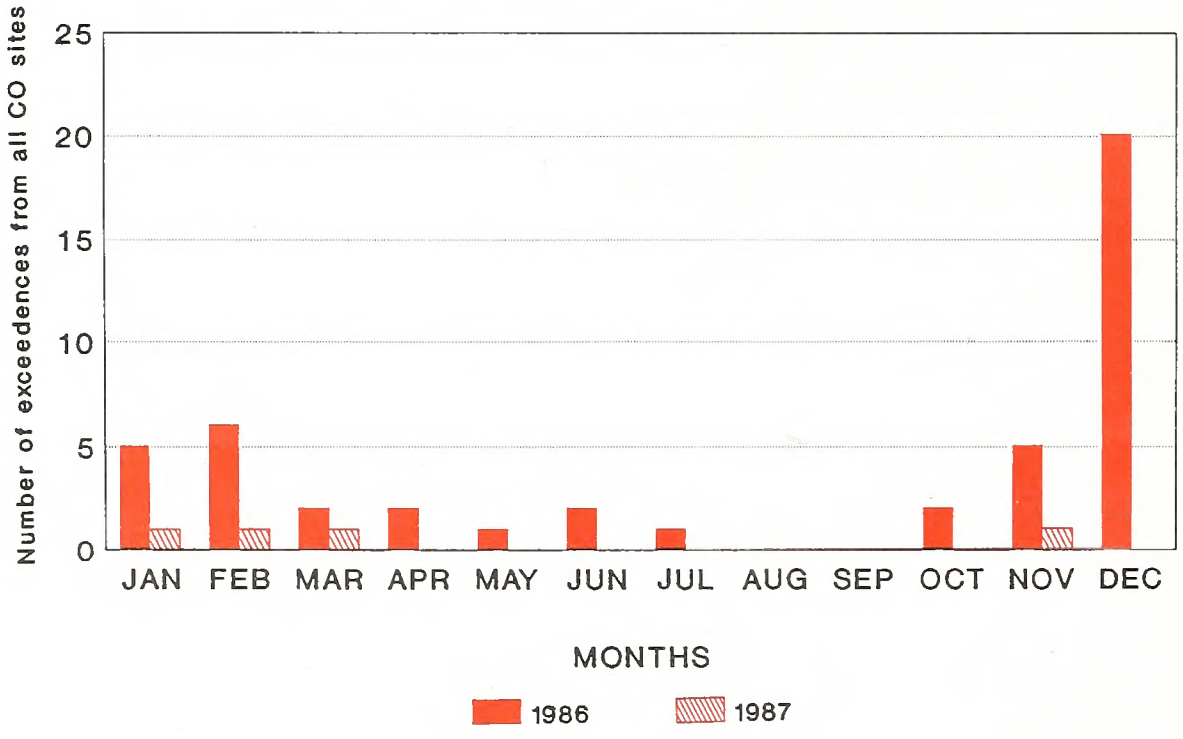
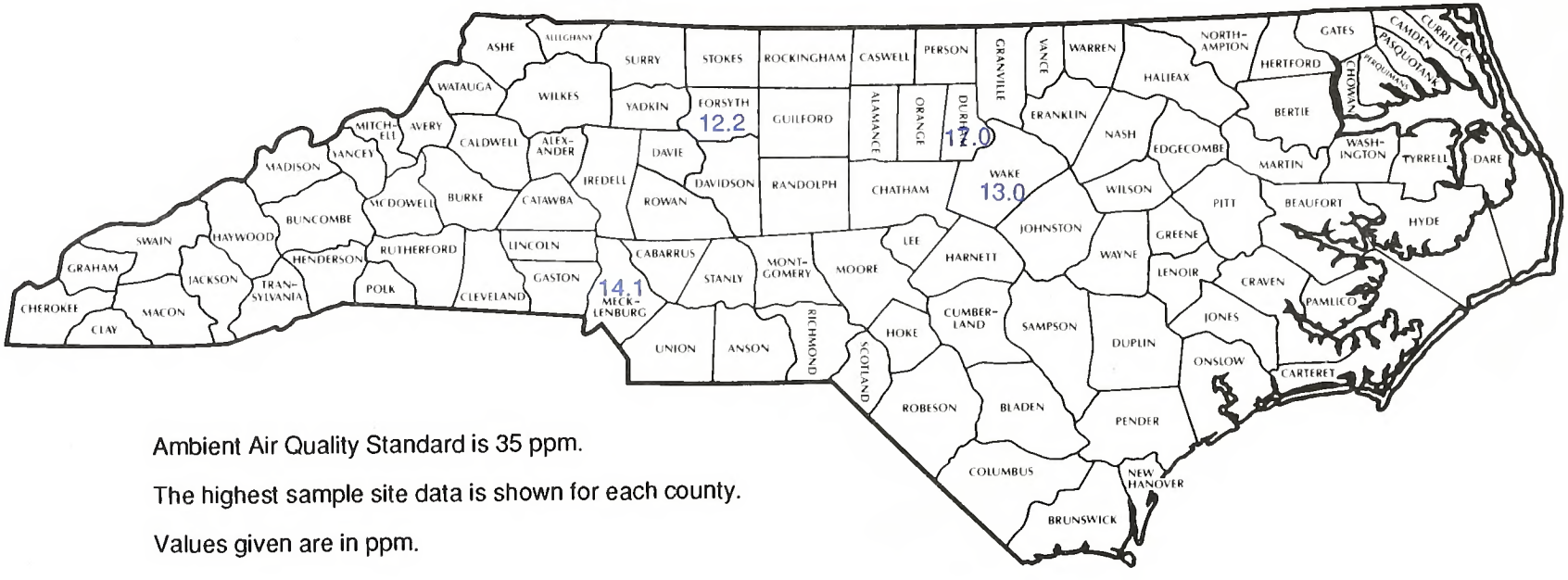


FIGURE 5
CARBON MONOXIDE
1987 Second Highest 1-Hour Average

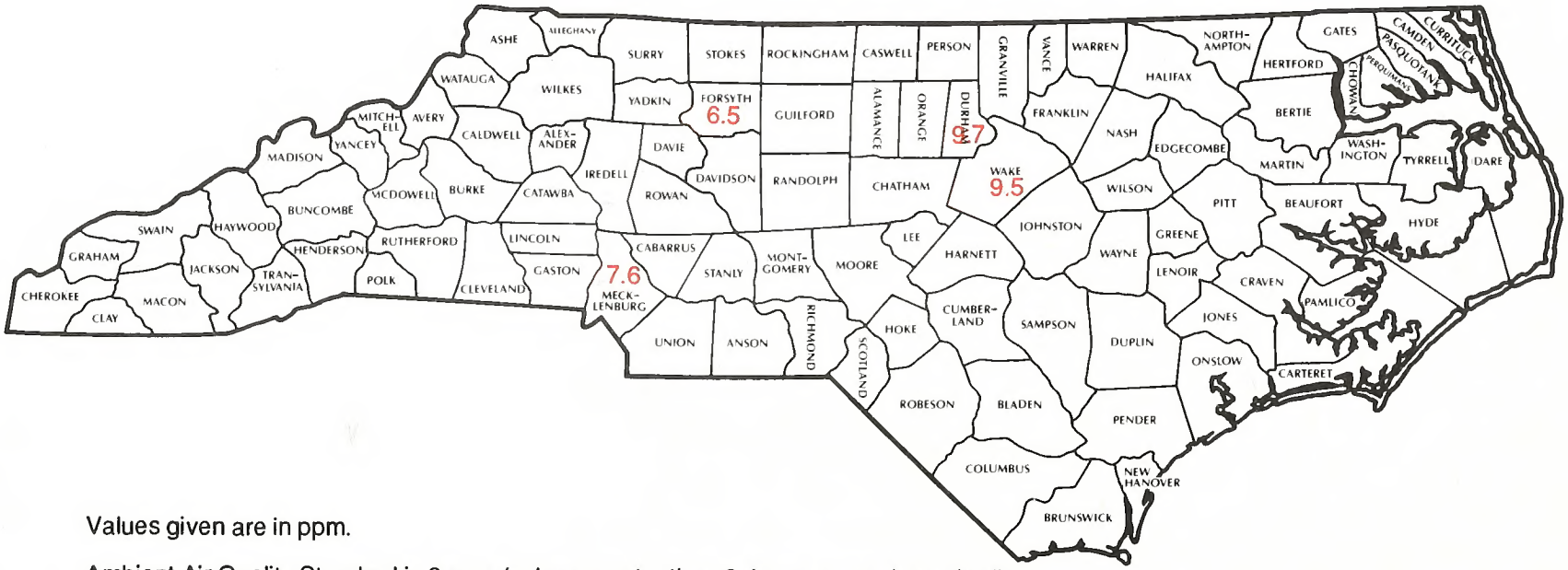


Ambient Air Quality Standard is 35 ppm.

The highest sample site data is shown for each county.

Values given are in ppm.

FIGURE 6
CARBON MONOXIDE
1987 Second Highest Non-overlapping 8-Hour Average

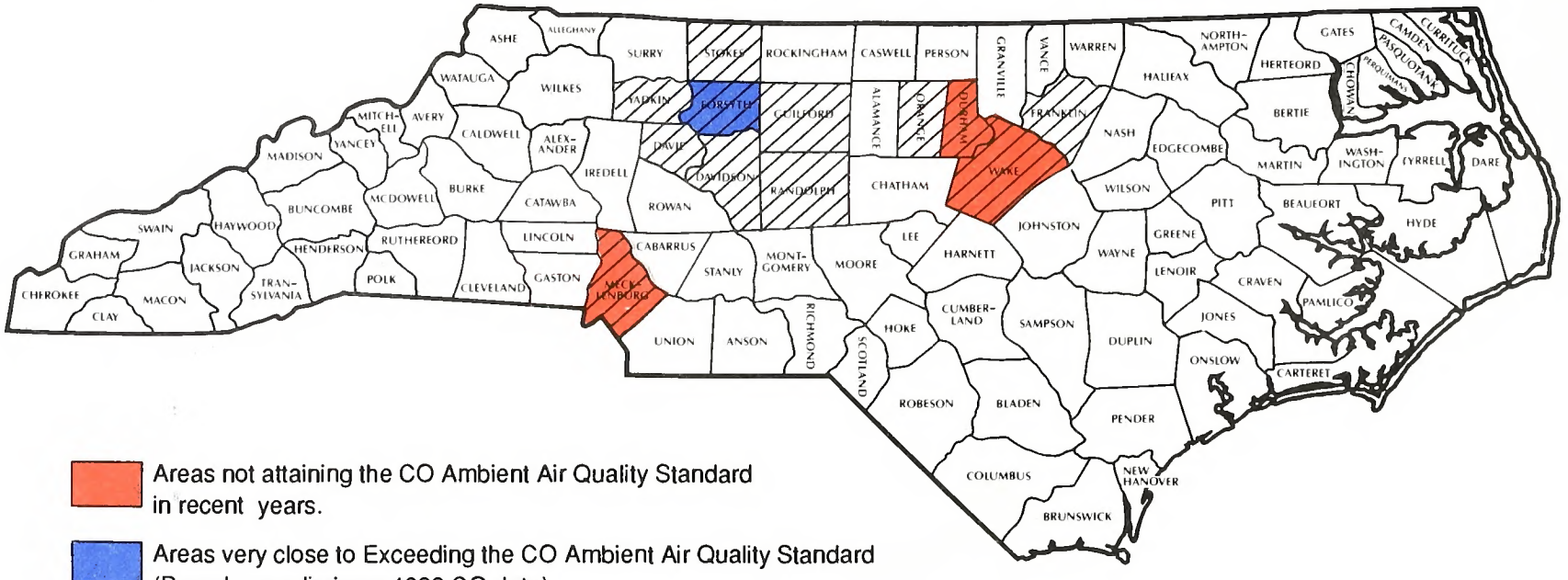


Values given are in ppm.

Ambient Air Quality Standard is 9 ppm (values greater than 9.4 ppm exceed standard).

The highest sample site data are shown for each county.

FIGURE 7
AREAS WITH EXCESSIVE CARBON MONOXIDE



Areas not attaining the CO Ambient Air Quality Standard in recent years.

Areas very close to Exceeding the CO Ambient Air Quality Standard (Based on preliminary 1988 CO data).

Areas where CO control strategies or maintenance demonstrations are likely.

II. D. Ozone

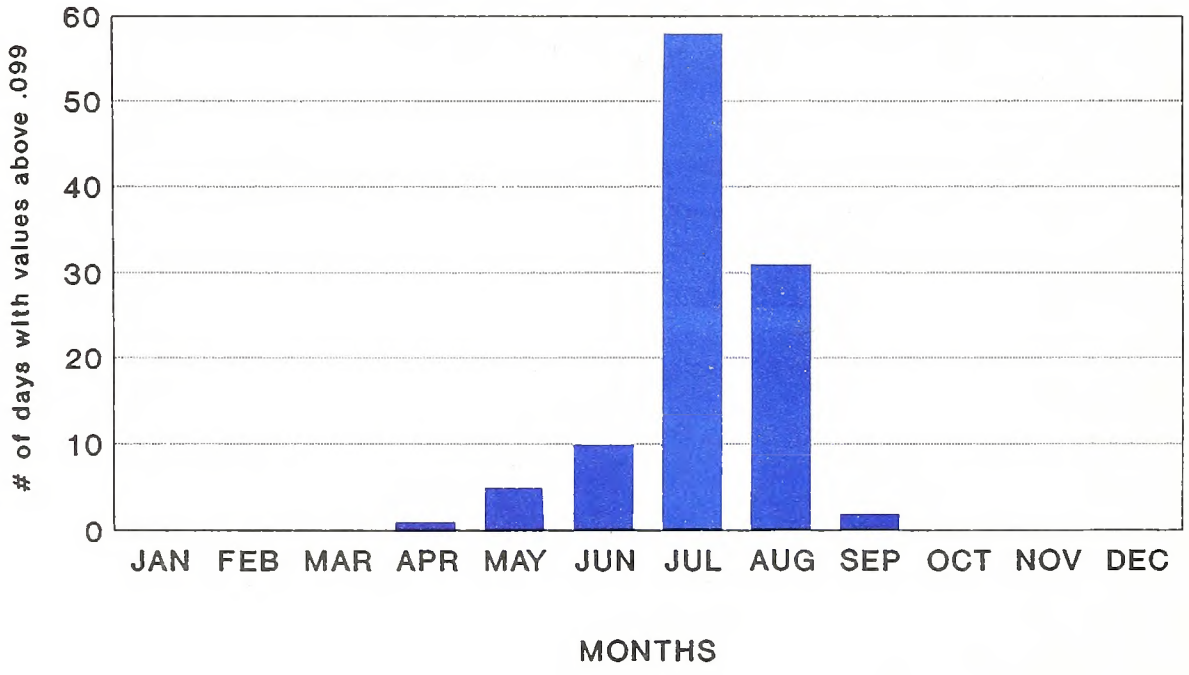
Ozone is a seasonal pollutant. Ozone is formed in the atmosphere as a result of many chemical reactions which occur in sunlight (photochemical reactions) mostly during the warmer months. For this reason, most of the ozone monitors only operate during April through October. The number of days with high ozone readings (readings >.099 ppm) from six areas is shown on a monthly basis in Figure 9.

Ozone (O_3) concentrations are measured using EPA Reference or Equivalent continuous monitors by the state and three local program agencies. There were 14 ozone monitoring sites operated in 1987. Most of these sites operated only during the ozone season, April through October. A total of 78,123 O_3 hourly measurements were made during 1987. A summary of these data appears in Table VI. Prior years' data from other sites which did not operate in 1987 are also included in Table VI. For some sites, monitor operations are suspended for two years and operated on the third year. By using this rotational operating strategy, data current within the last three years is available and operating costs are kept to a minimum.

The ozone ambient air quality standard is exceeded when one valid one-hour measurement exceeds .124 parts per million (ppm) at a site and a statistically derived expected number of exceedances exceeds 1. (.124 ppm when rounded to two decimal places, is not greater than the standard of .12 ppm; however, .125 ppm, when rounded to two decimal places is .13 and is greater than .12 ppm.) **Eight ozone monitoring sites exceeded .124 ppm on at least one occassion during 1987.** There were a total of 15 exceedances occurring at these eight sites. These 15 exceedances occurred on eight days in July and August.

All but two exceedances occurred on workdays when motor vehicle and industrial emissions can be expected to be higher.

FIGURE 9. FREQUENCY OF HIGH OZONE VALUES
(TOTALS FROM SIX AREA MONITORS)



emissions can be expected to be higher. The days having exceedances do not appear to be meteorologically unusual, though the daily high temperatures were in the 90's on all eight days with exceedances. The average winds were usually less than six miles per hour with only one exceedance occurring on a day with average winds greater than seven miles per hour.

Examination of the second highest measurement each year is a way to simply estimate the attainment status of an area. The second highest one hour values are shown in Figure 10 for the most recent season of data for all monitored areas. The areas not attaining the O_3 ambient air quality standard and areas which are just barely attaining the O_3 standard are shown in Figure 11.

Mecklenburg County has been designated as an ozone nonattainment area. At three Mecklenburg County ozone monitoring sites, the ambient air quality standards were exceeded on seven days. More strict hydrocarbon control strategies are being used in Mecklenburg County to reduce these ozone problems.

For the Durham area, the ambient air quality standard was violated at the "downwind" ozone site in Butner when a fourth value was reported above the standard on August 8, 1987. Due to this violation of the ambient air quality standard, control strategies will need to be developed for the entire metropolitan statistical area represented by the Butner ozone site. The five counties affected are Durham, Granville, Orange, Franklin, and Wake.

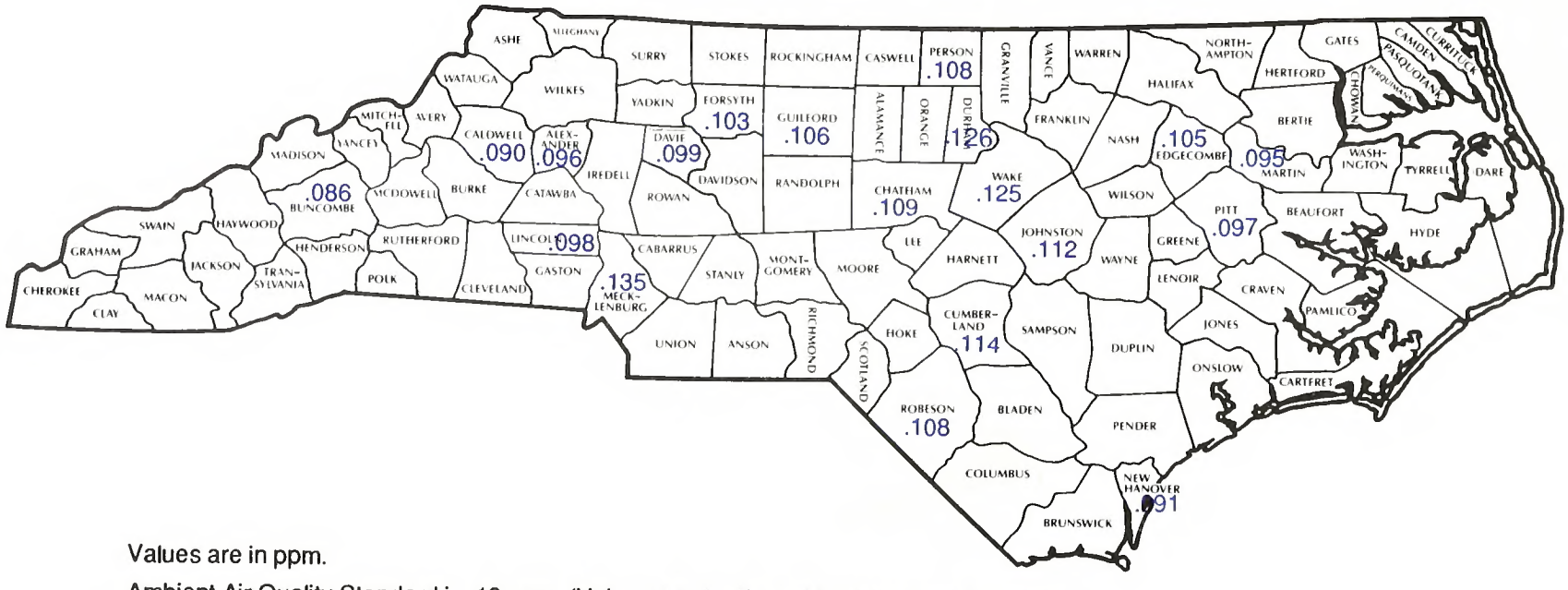
Several other areas of the state are very close to exceeding the ambient air quality standard for ozone. In 1987, Winston Salem, Fayetteville, and Wake Forest monitors reported one exceedance each. These areas, as well as several others, are being carefully watched.

A preliminary look at the 1988 ozone data is included in Appendix C of this report, "Ozone Exceedances in the Last Three Years". In 1985, there were no reported ozone exceedances in the state. There have been progressively more frequent ozone exceedances over the past four years, with 69 occurring in 1988. More and higher ozone exceedances occurred in more areas in 1988 than any other year of record. **Ozone has become the criteria pollutant of greatest concern in North Carolina.**

TABLE VI: Ozone In Parts Per Million (PPM) For 1987

SITE NUMBER	COUNTY	CITY	ADDRESS	NUM OBS	DAILY 1-HOUR MAXIMA 1st	2nd	3rd	4th	VALUES> 125 MEAS	EST
37-003-0003	Alexander	Taylorsville	SR 1107 & 1117	4533	.097	.096	.096	.094		
37-021-0029	Buncombe	Fairview	Hwy 74 SE	4907	.097	.086	.086	.085		
37-037-0098	Chatham	Moncure	Moncure Plant	4523	.115	.109	.108	.103		
37-051-0001	Cumberland	Eastover	Old US Hwy 301 N	5441	.125	.114	.113	.110	1	1.2
37-065-0099	Edgecombe	Leggett	NC 97	4845	.105	.105	.103	.100		
37-067-0004	Forsyth	Winston Salem	Old Walkertown Rd.	5051	.129	.103	.100	.098	1	1.0
37-067-0006	Forsyth	Winston Salem	Goodwill Church	4896	.129	.093	.090	.090	1	1.0
37-077-0001	Granville	Butner	Water Treatment Plt.	4618	.126	.126	.125	.120	3	3.2
37-081-0011	Guilford	McLeansville	Keely Park	4804	.117	.106	.104	.104		
37-101-0099	Johnston	Micro	SR 2141	4715	.116	.112	.112	.110		
37-119-0034	Mecklenburg	Charlotte	Plaza & Lakedale	8353	.127	.127	.119	.114	2	2.0
37-119-1005	Mecklenburg	Charlotte	400 Arrowood Blvd.	8501	.151	.135	.131	.128	4	4.0
37-119-1009	Mecklenburg	Charlotte	29 N	8263	.138	.121	.120	.119	1	1.0
37-183-2001	Wake	Wake Forest	Hwy 98 Wake Forest	4673	.129	.125	.111	.109	2	2.1
1986 Data										
37-027-0003	Caldwell	Lenoir	US 321 N	4820	.095	.090	.088	.087		
37-067-0006	Forsyth	Winston Salem	Belews Creek	4993	.122	.111	.100	.098		
37-117-0099	Martin	Farmlife	NC 171	4722	.107	.095	.094	.093		
37-145-0099	Person	Gordonton	US 49 and SR 1102	4289	.110	.108	.106	.106		
1985 Data										
37-059-0099	Davie	Fork	Recreation Center	4674	.116	.099	.098	.098		
37-109-0099	Lincoln	Iron Station	SR 1315 and SR 1313	4938	.110	.098	.098	.096		
37-129-0002	New Hanover	Castle Hayne	Blue Berry Farm	5473	.094	.091	.091	.091		
37-147-0099	Pitt	Farmville	US 264 Water Tank	4936	.097	.097	.095	.091		
37-155-0099	Robeson	St. Pauls	Nat. Guard Armory	5034	.111	.108	.098	.091		

FIGURE 10
OZONE
1987, 1986, or 1985 Second Highest 1-Hour Averages*

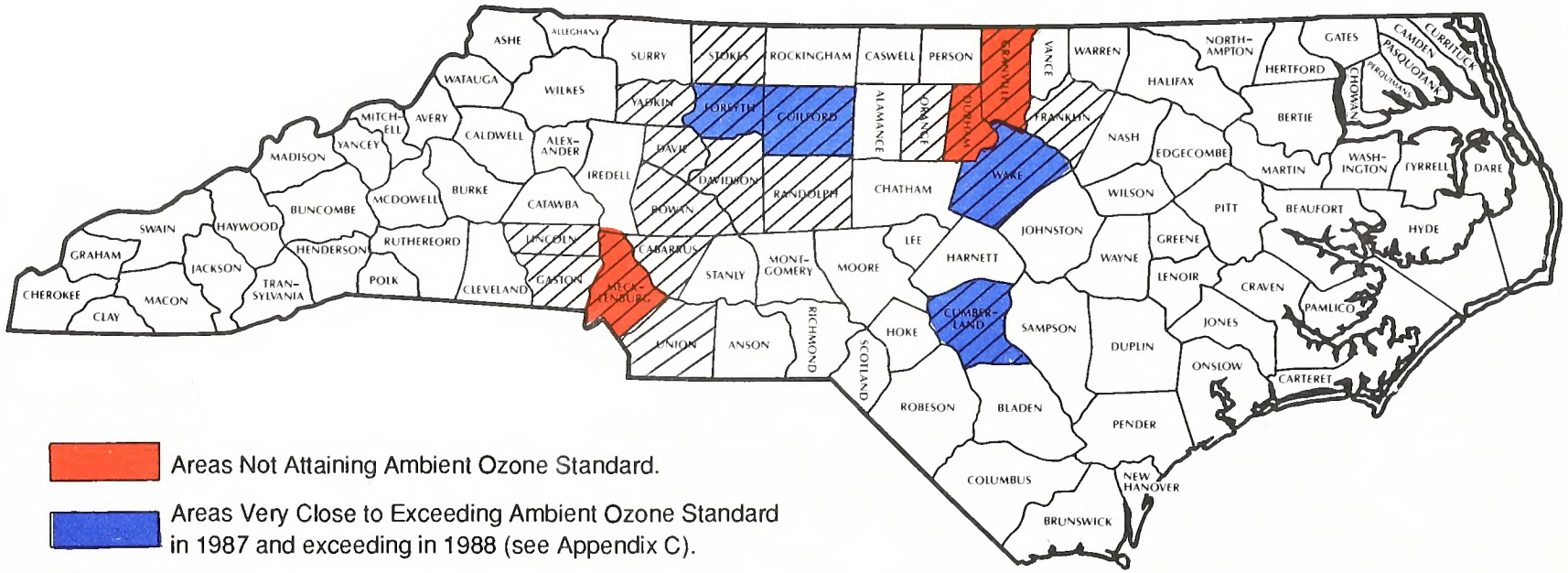


Values are in ppm.

Ambient Air Quality Standard is .12 ppm. (Values greater than .124 ppp exceed standard).

* The most recent year of data are shown -- some sites do not operate every year.

FIGURE 11
AREAS WITH EXCESSIVE OZONE



Areas Not Attaining Ambient Ozone Standard.

Areas Very Close to Exceeding Ambient Ozone Standard in 1987 and exceeding in 1988 (see Appendix C).

Areas where Ozone Control Measures are likely.

Note: Based on 1988 data, all of the shaded areas exceeded the Ambient Ozone Standard.

II. E. Sulfur Dioxide

Sulfur dioxide (SO_2) concentrations were measured using EPA Reference or Equivalent continuous monitors by the state and two local program agencies. Eleven SO_2 monitoring sites reported a total of 89,477 SO_2 hourly measurements during 1987. A summary of these data appears in Table VII. Prior years' data from other sites which did not operate in 1987 are also included in Table VII. For some sites, monitor operations are suspended for two years and operated on the third year. By using this rotational operating strategy, data current within the last three years is available for use and operating costs are kept to a minimum.

To determine attainment status with the SO_2 ambient air quality standard, the data must be evaluated in three ways: 3-hour averages, 24-hour averages, and the annual arithmetic mean. **There were no exceedances of the SO_2 ambient air quality standards as reported by these monitors.** It appears that high ambient SO_2 concentrations do not exist over large areas (e.g. county wide), as ozone does. The highest ambient SO_2 concentrations existed for short periods near major SO_2 sources. In 1987 the Acme-Delco site in Columbus County measured the highest values, reporting a three hour average concentration that was 52 percent of the three hour standard, and a 24-hour average that was 83 percent of the 24-hour Ambient Air Quality Standard.

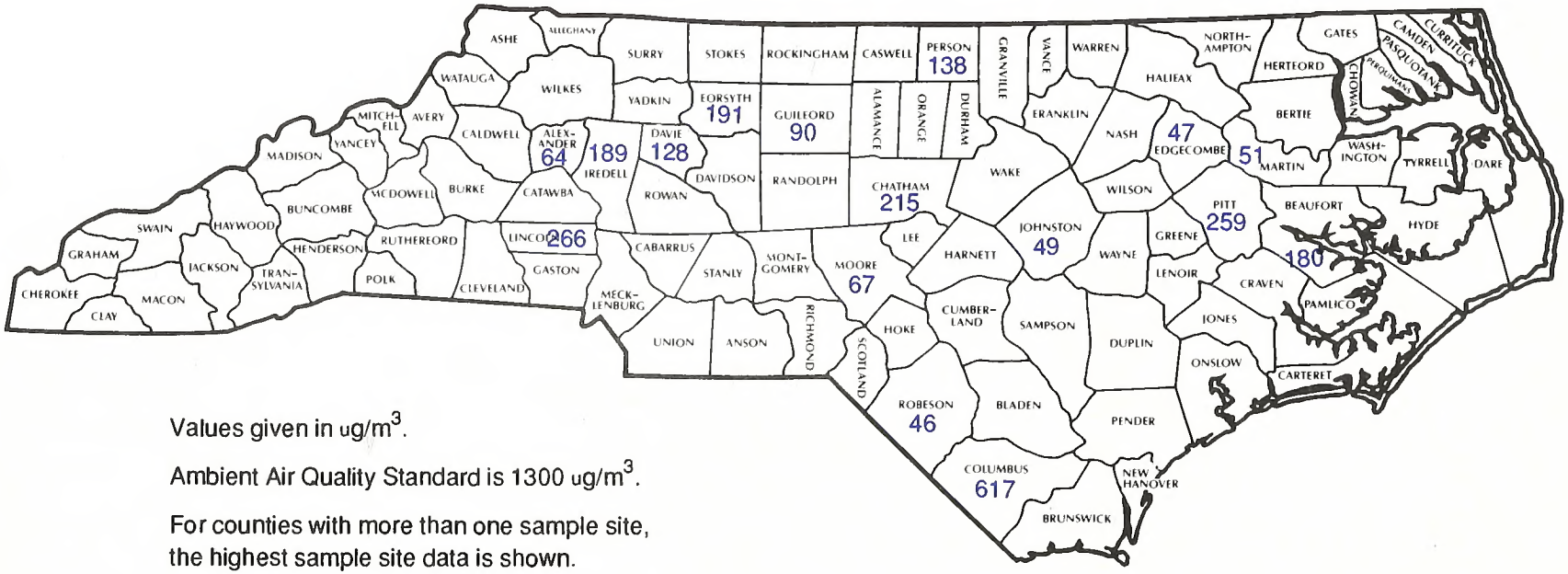
It appears that the size of an urban area has little effect on the ambient concentrations of SO_2 in North Carolina. Further, there do not appear to be large seasonal variations in average SO_2 concentrations as evident with carbon monoxide or ozone. Major source characteristics such as type, size, distribution, control devices, operating conditions, and dispersion situations significantly affect the amount of SO_2 measured in ambient air. The second highest 3-hour values are shown in Figure 12 for the most recent year of data for all monitored areas.

TABLE VII: Sulfur Dioxide In Micrograms Per Cubic Meter (mg/m^3) For 1987

				NUM	MAX 1-HR		MAX 3-HR		MAX 24-HR		ARITH
SITE ID	COUNTY	CITY	ADDRESS	OBS	1st	2nd	1st	2nd	1st	2nd	MEAN
37-003-0003	Alexander	Taylorsville	SR 1107 & 1117	8294	102	90	67	64	43	42	8
37-013-0003	Beaufort	Aurora	NC Highway 306	8025	510	476	185	180	62	59	9
37-037-0098	Chatham	Moncure	Moncure Plant	8188	619	615	394	215	94	87	12
37-047-0001	Columbus	Acme	Delco Tel. Substa..	7899	1399	1019	673	617	304	153	15
37-065-0099	Edgecombe	Leggett	NC 97	8013	222	90	47	47	26	23	7
37-067-0007	Forsyth	Winston Salem	Ferguson School	8380	335	313	231	188	60	55	20
37-067-0022	Forsyth	Winston Salem	1300 Block Hattie St.	8477	314	243	199	191	75	74	18
37-081-0010	Guilford	Greensboro	1305 Merritt Dr.	7719	182	162	90	90	63	57	14
37-097-0002	Iredell	Troutman	SR 2350 Troutman	8223	403	372	204	189	82	60	13
37-101-0099	Johnston	Micro	US 301 & SR 2141	8065	55	54	51	49	37	29	8
37-155-0099	Robeson	St. Pauls	National Guard Armory	8194	64	60	46	46	36	35	9
1986 Data											
37-117-0099	Martin	Farmlife	NC 171 & SR 1538	7575	64	64	62	51	35	29	7
37-145-0099	Person	Gordonton	NC 49 & SR 1102	7804	236	183	178	138	55	53	11
1985 Data											
37-059-0099	Davie	Fork	Recreation Center	7640	168	138	128	128	76	45	11
37-109-0099	Lincoln	Iron Station	SR 1315 & SR 1313	7460	394	357	320	266	117	82	12
37-147-0099	Pitt	Farmville	US 264 Water Tank	8006	407	387	381	259	87	42	9

There were no exceedances of the SO_2 ambient air standards at any of these sites during this three year period.

FIGURE 12
SULFUR DIOXIDE
Second Highest 3-Hour Averages for Most Recent Year



Values given in ug/m^3.

Ambient Air Quality Standard is 1300 ug/m^3.

For counties with more than one sample site, the highest sample site data is shown.

II. F. Nitrogen Dioxide

Nitrogen dioxide (NO_2) concentrations were measured using EPA Reference or Equivalent continuous monitors at two sites in Forsyth County. These monitors were operated by the Forsyth County local program agency. A total of 16,180 NO_2 hourly measurements were reported. A summary of these data appears in Table VIII.

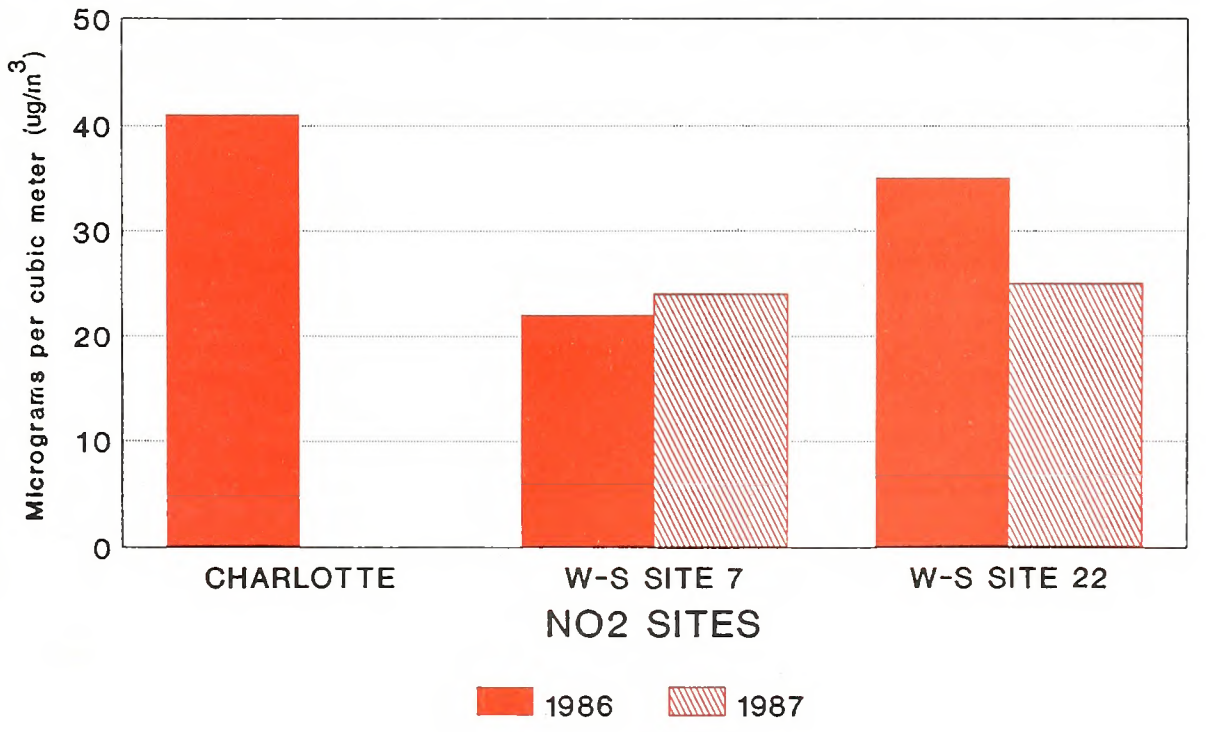
NO_2 has been determined to not be a "problem" pollutant in North Carolina based on recent continuous monitor data and a long history of manually collected NO_2 data. **No exceedances of the NO_2 ambient air quality standard have ever been reported from continuous air monitors operated at state, local, and industrial sites in the state.** Furthermore, the operation of NO_2 monitors has been shown to be the most difficult, manpower intensive, and costly of all criteria pollutant monitors. For these reasons, only a few NO_2 monitors are currently being operated. More NO_2 monitoring will begin in 1989 to gather data needed to develop an ozone control strategy in the Raleigh and Durham areas.

A comparison of the 1987 NO_2 data with the standard is shown below in Figure 13 .

TABLE VIII: Nitrogen Dioxide In Parts Per Million (PPM) For 1987

SITE ID	COUNTY	CITY	ADDRESS	NUM OBS	MAX 1-HR 1st	MAX 1-HR 2nd	ARITH MEAN
37-067-0007	Forsyth	Winston Salem	Ferguson School	8512	.075	.074	.012
37-067-0022	Forsyth	Winston Salem	1300 Hattie Avenue	7668	.138	.130	.018

FIGURE 13. 1987 NITROGEN DIOXIDE COMPARISON TO ANNUAL STD (100 ug/m^3)



II. G. Lead

The state and local program agencies have not performed routine lead (Pb) analysis in North Carolina since 1982. **This ambient air lead monitoring was stopped as a result of the low values measured and as a result of the continuing decrease in the lead concentrations being reported.** The 1982 ambient lead concentrations were approximately one-half of the 1979 levels.

Five state and local program agency TSP sites have been selected by the federal EPA as National Filter Analysis Network (NFAN) sites. The EPA performs lead analysis on filters provided by the state and local program agencies. The most recent year of data available from the NFAN is 1986. The 1986 data is included below in Table IX. Lead concentrations in 1986 are approximately one-quarter of the 1982 levels. The 1987 lead concentrations are expected to continue to decrease, but at a slower rate.

Two factors are believed to be responsible for this decrease in the ambient air lead concentrations: (1) The amount of leaded gasoline being used in North Carolina is decreasing each year. Thus, less lead is emitted from cars. (2) The quantity of lead in leaded fuel is being reduced by EPA regulation. Thus, less lead is emitted from cars burning leaded fuel.

TABLE IX: Lead In Micrograms Per Cubic Meter (mg/m^3) For 1987

						QUARTERLY ARITH MEANS				MEANS
SITE ID	COUNTY	CITY	ADDRESS	YR	OBS	1st	2nd	3rd	4th	>1.5
37-063-0001	Durham	Durham	300 East Main St.	86	27	.10	.05	.05	.08	0
37-067-0021	Forsyth	Winston Salem	Sixth & Broad St.	86	27	.07	.05	.05	.06	0
37-081-0009	Guilford	Greensboro	Edgeworth & Bellemeade St.	86	19	.10	.05	.05	.10	0
37-119-0001	Mecklenburg	Charlotte	600 East Trade St.	86	21	.10	.05	.05	.10	0
37-183-0003	Wake	Raleigh	Fire Station #9, Six Forks Rd.	86	27	.09	.06	.06	.06	0

III. DESCRIPTION OF POLLUTANTS

III. A. Particulate Matter

Atmospheric particulate matter is defined as any airborne material, except uncombined water, (water, mist, steam, etc.) which exists in a finely divided form as a liquid or solid at standard temperature and pressure (25° C and 760 mm mercury) and has an aerodynamic diameter of less than 100 micrometers. Currently, the monitoring network is measuring two sizes of particulate matter; total suspended particulate (TSP), and PM-10. Total suspended particulate is any particulate matter measured by the method described in EPA regulation 40CFR50, Appendix B and is generally believed to be particles having an aerodynamic diameter of 45 micrometers or less. A 19-year history of measurements of TSP exists in North Carolina.

PM-10 is defined as particulate matter with an aerodynamic diameter of less than or equal to a nominal 10 micrometers as measured by the method described in EPA regulation 40CFR50, Appendix J. Some PM-10 monitoring has been conducted in North Carolina during 1987. More PM-10 monitoring is being planned in 1988 and 1989. On July 31, 1987, the Environmental Protection Agency adopted new ambient air quality standards regulations for PM-10 which replace the national TSP ambient air quality standards. The state TSP ambient air quality standard has been retained . The state adopted the new PM-10 standard effective July 1, 1988.

Particulate Sources

Particulates are emitted by many of man's activities, such as fuel combustion, motor vehicle operation and movement, industrial processes, grass mowing, agricultural tilling and open burning. Natural sources include wind-blown dust, forest fires, volcanic eruptions and vegetation which releases pollen.

Particles that are emitted directly from a source may be either fine or coarse, but particles which are formed in the atmosphere will usually be fine. Generally, course particles (2.5 - 60 micrometers) have very slow settling velocities and are characterized as suspended particulate matter. Fine particles (less than 2.5 micrometers) typically originate by condensation of materials produced during combustion or atmospheric transformation.

Particulate Effects

Health effects of particulate matter include: effects on the breathing system, aggravation of existing lung and heart disease, effects on lung clearance, changes in form and structure of organisms and development of cancer. The individuals most sensitive to the effects of particulate matter include: individuals with chronic obstructive lung or heart disease, individuals with flu, asthmatics, the elderly, children and mouth breathers. Health effects from inhaled particles are influenced by the depth of penetration of the particles into the respiratory system, the amount of particles deposited in the respiratory system, and by the biological reaction to the deposited particles. The risks of adverse health effects are greater when particles enter the tracheobronchial and alveolar (bronchial tubes and lungs) portions of the respiratory system. Small particles can penetrate into these deeper regions of the respiratory system. For the particles larger than 10 micrometers, healthy respiratory systems can trap the particles more efficiently before they move deep into the system and can more effectively remove those that do move deep into the system.

Welfare effects are those that influence one's quality of life other than human health effects. Particulate matter can form a film on plant leaves, reducing sunlight and subsequently interfering with photosynthesis. Other effects of particles include soiling and degradation of property, which can be costly in terms of cleaning and maintaining surfaces. Reduction of visibility occurs when small particles absorb or scatter visible light.

III. B. **Carbon Monoxide**

Carbon monoxide (CO) is the most commonly occurring air pollutant, and it is also the most widely distributed. It is estimated that total CO emissions to the atmosphere comprise approximately 60 percent of all pollutant emissions in North Carolina.

CO Sources

Most atmospheric CO is produced by incomplete combustion of fuels for vehicles, space heating, industrial processes and solid waste combustion. Transportation activities account for the majority of the CO emissions. Boilers and other fuel burning heating systems are also significant sources of CO.

CO Effects

Breathing carbon monoxide affects the oxygen carrying capacity of the blood in both sick and healthy individuals. Hemoglobin in the blood attaches to CO more readily than it does to oxygen, thus depriving the body of vital oxygen.

Carbon monoxide diminishes the function of even healthy individuals. Individuals with anemia, lung, and heart diseases are particularly sensitive to CO effects. At low concentrations, mental function, vision, and alertness are affected. It appears that cardiac damage may result from chronic exposure to CO at levels as low as 70 ppm (80 mg/m^3). Other health effects associated with exposure to CO include central nervous system effects and pulmonary function difficulties.

Ambient concentrations apparently do not adversely affect vegetation or materials. The effects on animals are similar to those on humans.

III. C. **Ozone**

The ozone ambient air quality standards and statewide ozone monitoring are concerned with the ozone concentrations in the lower atmosphere where we live and breathe. Ozone in the lower atmosphere is harmful to people, animals, vegetation, and materials even in low concentrations. From 1987 and very recent preliminary 1988 data, ozone has become the most widespread and serious criteria air pollutant problem in North Carolina.

Ozone Sources

Ozone (O_3) is the major compound of the complex mixture of compounds known as photochemical oxidants. Ozone is not usually emitted directly into the atmosphere as are the other criteria pollutants, but is formed by a series of complex reactions involving hydrocarbons, nitrogen oxides and sunlight. Ozone concentrations are higher during the daytime in late spring, summer and early autumn when the temperature is above 60°F and the sunlight is more intense. North Carolina's ozone season is April through October.

Two natural sources of ozone are electrical discharge during thunderstorms and solar radiation in the stratosphere. Those two sources are not believed to be significant in the lower atmosphere.

Ozone Effects

Ozone is a pulmonary irritant and affects the respiratory mucous membranes as well as other lung tissues and respiratory functions. Studies have demonstrated ozone impairment of the normal function of the lung, causing shallow, rapid breathing and a decrease in pulmonary function. Other symptoms of ozone exposure include chest tightness, coughing and wheezing. People with asthma, bronchitis, or emphysema will probably experience breathing difficulty when exposed to short-term concentrations between 0.15 and 0.25 ppm. With continued or repeated long-term exposure, permanent lung structure damage may occur even in healthy people. Ozone has also been shown to interfere with the immune system function in animals. Recent studies have indicated that ozone concentrations of less than 0.12 ppm may have health effects on certain people. The federal EPA is continuing to evaluate the health effects data.

Ozone accelerates the aging of many materials, causing rubber cracking, dye fading, paint erosion, and plant damage. In general, ozone injury to vegetation develops initially at the tips of young leaves and becomes more widespread as the leaves mature. The most common ozone symptoms on broad-leaved plants are small flecks visible on the upper leaf surface. This problem has been severe on sensitive varieties of tobacco and is generally referred to as weather fleck. Some of the agricultural and garden vegetation affected include tobacco, corn, soybeans, tomato, rye, wheat, beans, potatoes, melons, alfalfa, spinach, onions and grapes. Other vegetation affected includes gladiolus, azalea, eastern white pine, loblolly pine, Virginia pine, locust, white oak and poplar. Many of these plants are of economic importance in North Carolina. Adverse effects on sensitive vegetation have been observed from exposure to ozone concentrations of 0.05 ppm (100 mg/m^3) for four hours.

Good Ozone

Not all ozone is bad for us. High concentrations of ozone in the upper atmosphere protect us. Upper atmospheric ozone is needed to absorb the high energy sunlight (ultraviolet light). Without sufficient upper atmospheric ozone, more ultraviolet light will reach the surface of the earth. Too much exposure to ultraviolet light has been shown to cause skin cancer. It is believed many air pollutants are causing depletion of the upper atmospheric ozone. One type of chemical, chlorofluorocarbons, is believed to play a major part in the upper atmospheric ozone depletion. International studies and conferences are underway to develop strategies to reduce this problem.

III. D. Sulfur Dioxide

More than 90 percent of sulfur oxide emissions occur as sulfur dioxide (SO_2); the balance occurs as sulfur trioxide (SO_3) and various forms of sulfates. For this reason nearly all sulfur oxide ambient monitoring nationwide is for sulfur dioxide. It is a colorless gas that can be detected by taste at concentrations of 0.38 to 1.15 ppm.

SO_2 Sources

The main sources of SO_2 are the combustion of fossil fuels containing sulfur compounds and the manufacturing of sulfuric acid. Other sources include refining of petroleum and smelting of sulfur containing ores.

SO_2 Effects

The most obvious health effects of sulfur dioxide are irritation and inflammation of body tissues that are contacted by the gas. Sulfur dioxide can increase the severity of existing respiratory diseases such as asthma, bronchitis, or emphysema. Breathing SO_2 causes bronchial constriction, which results in increased resistance to air flow, reduction of air volume and increased respiratory rate and heart rate. Asthmatics showed increases in airway resistance after exposures of only 5 to 10 minutes of SO_2 concentrations even below 0.5 ppm (1300 mg/m^3). The federal EPA is evaluating the health effects data and is considering adoption of a more "restrictive" 1-hour ambient air quality standard. Transformation products of SO_2 such as sulfuric acid aerosol and fine particulate sulfates may also cause significant health problems.

Sulfur dioxide can damage many types of vegetation. The injury symptoms usually consist of a bleaching appearance and can occur both between the veins and on the margins. Many plants of economic importance are sensitive to SO_2, including cotton, sweet potatoes, wheat, cucumber, alfalfa, peas, oats, gladiolus, tulips, blue grass, violet, zinnia, apple trees and several types of pine trees.

Another effect of SO_2 transformation products is the reduction of visibility. Sulfates are a major component of atmospheric fine particulate material, and because some sulfates have a water absorbing capacity, their impact on visibility is greatly increased at high humidities. Observations of widespread hazes in the eastern United States appear to be increasing with SO_2 emissions.

Another of the principal concerns is the suspected role of sulfur dioxide in causing acid rain, which is usually observed in regions of high sulfate concentrations. Acid rain can lower the pH of soils and natural waters, cause mineral leaching, damage vegetation and deplete fish populations in some lakes.

III. E. Nitrogen Oxides

There are several oxides of nitrogen in the atmosphere, but the most prevalent ones are nitric oxide (NO) and nitrogen dioxide (NO_2). Nitrogen oxides play a role in the formation of ozone during the summer months. For this reason, new monitoring sites are scheduled to be established in areas exceeding the ozone standard.

NO_2 Sources

The most important nitrogen oxide emissions occur as a result of man's burning of fossil fuels such as coal, oil and gasoline. Nitrogen oxides are emitted from combustion sources primarily as nitric oxide (NO). Through reactions with other atmospheric compounds such as hydrocarbons and ozone, the NO is converted to nitrogen dioxide. Nitrogen dioxide may undergo further transformation into gaseous nitric acid (HNO_3) and nitrate particulates.

NO_2 Effects

Nitrogen dioxide has effects on human health, especially the sensitive members of the population. Asthmatics and children are likely to be affected by NO_2 concentrations as low as 0.5 ppm.

Nitrogen oxides also indirectly affect human health by their contribution to the formation of ozone.

Some types of vegetation are very sensitive to nitrogen dioxide; they include oats, alfalfa, tobacco, peas and carrots. The one primary symptom of chronic NO_2 exposure is chlorosis (yellowing), while acute NO_2 exposure usually causes the appearance of irregular shaped lesions within the leaves. Earliest indications of injury are gray-green water-soaked areas located on the upper leaf surface.

Nitrogen dioxide and particulate nitrates are among the pollutants that cause visibility impairment. In high concentrations NO_2 gas is reddish-brown and it is thought to contribute a significant portion of the brownish coloration often observed in polluted air in the colder months.

Nitrogen oxides also contribute to acid deposition by forming nitric acid. It has been estimated that nitric acid comprises approximately 25 to 30 percent of the acidity in precipitation.

III. F. Lead

Lead compounds exist in the atmosphere as gases or particles.

Lead Sources

The major source of atmospheric lead is the combustion of leaded gasoline (tetraethyl lead is added as an antiknock agent). Battery manufacturers are a minor source of lead in this state. Lead is also used in paints, insecticides and newspaper inks. With the continued decrease in the amount of leaded fuels used and the decreased concentration of lead in those fuels, lead emissions from sandblasting of bridges, overpasses, and water tanks have the potential to be the most significant sources of lead air contamination in the state.

Lead Effects

Lead (Pb) persists and accumulates in the environment and in the human body. It enters the body through eating and breathing and is eventually absorbed into the blood stream and distributed to all body tissues. Exposure to low concentrations interferes with specific enzyme systems and blood production. It is also believed to be a cause of kidney and nerve cell damage. Brain damage has been documented in cases of severe lead poisoning in children. Also noted were headaches, restlessness, tremors and general symptoms of mental retardation. Convulsions are not uncommon and may be followed by coma. People at greatest risk include battery workers, solderers, sandblasters, and small children who play near lead sources.

IV. Ambient Air Monitoring Program Description

Ambient monitoring and analysis of samples were conducted by the Division of Environmental Management and four local air pollution control programs. These programs are listed in Appendix A. The collected air monitoring data are used to determine if air quality standards are being met, to assist in enforcement actions, to determine the improvement or decline of air quality and to determine the extent of allowable industrial expansion. The sites are listed in alphabetic order by county in Table X at the end of this section. A map showing the general locations of the ambient air monitoring sites is shown below in Figure 14.

Specific monitor siting involves considerations such as representativeness of site, distance from roadways and nearby sources, unrestricted air flow, safety, availability of electricity and security.

All sites have a defined monitoring objective and annual evaluations are made to ensure that the objectives are met. The four basic monitoring objectives are:

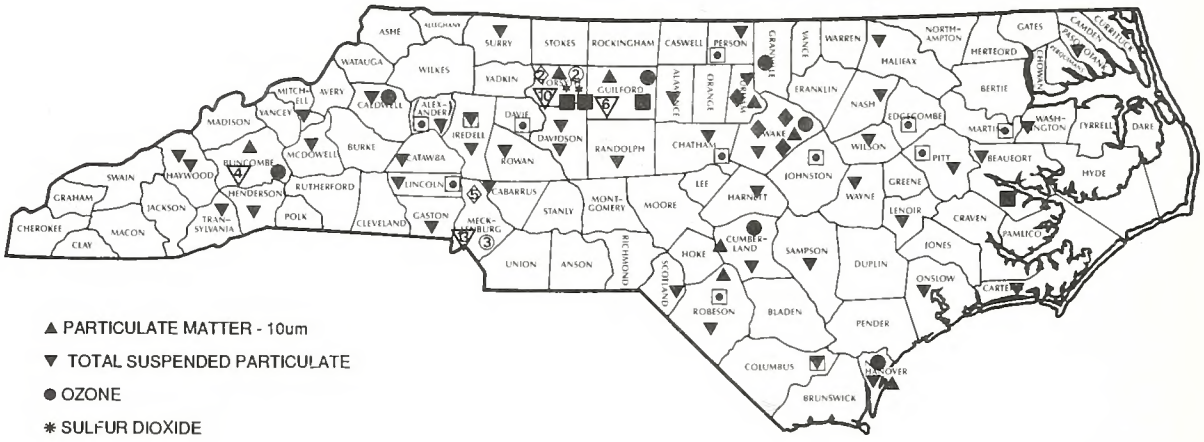
1. to determine the highest concentration expected in an area,

2. to determine representative concentrations in areas of high population density,

3. to determine the impact of significant sources or source categories on ambient air quality, and

4. to determine general background concentration levels.

FIGURE 14. LOCATIONS OF MONITORING SITES



All monitors have known precision, accuracy, interferences and operational parameters. The monitors, as well as all measurement devices, are carefully calibrated at predetermined frequencies, varying from daily to quarterly. Measurements are traceable to the National Bureau of Standards when standards are available.

Standard operating procedures are followed in monitoring and analyses. Field personnel visit the manual sites once every sixth day to replace sample media and check the operation and calibration of the monitors. Continuous monitors are checked at least twice weekly for correct instrument operation.

Quality assurance activities determine the quality of the collected ambient data, improve the quality of the data and evaluate how well the monitoring system operates. The objectives of the quality assurance activities are to produce high quality air pollution data with defined completeness, precision, accuracy, representativeness and comparability.

At most sites, microprocessors are being used to collect the data. The system assembles the data for submission to the US Environmental Protection Agency. This enhances data validity, minimizes travel cost, and allows real-time data to be available by computer polling when needed. Numerous checks are performed to ensure that only valid data are reported.

V. AIR QUALITY INDEX

In addition to this annual data report, up-to-date air quality information is available 24-hours a day in four areas of the state through the use of the air quality index (AQI) telephone numbers. These numbers are listed below:

Charlotte	704-333-SMOG
Durham	919-733-DATA
Fayetteville	919-486-9413
Raleigh	919-733-DATA

Citizens of these areas can check the quality of the air they are breathing on a nearly real-time basis by calling the listed telephone number. The Durham AQI is included as a part of the Raleigh AQI and is a long distance call from Durham, but the other numbers are local calls from the respective areas.

When any of the numbers are called, a recorded message will provide the current air quality report, which is updated every four hours based on information from the local area air pollutant monitors.

The report provides the air quality index for the pollutant with the highest concentration and a word describing the expected effect of the pollutant on human health. The descriptions are good, moderate, unhealthful, very unhealthful, and hazardous. Index levels do not normally exceed the unhealthful range (AQI>199), with most reports in the good-moderate range, between zero and 100. A nationwide method of assigning the index numbers is used so travelers from other parts of the country can interpret a local index.

The index rates the air quality from zero to 500. Index numbers of zero to 49 are considered good and indexes of 50-99 are considered moderate with no adverse health effects expected and no protective actions recommended.

An index of 100-199 is described as unhealthful and can produce mild aggravation of symptoms in susceptible persons and possible irritation in healthy persons. People with existing heart or lung ailments should reduce physical exertion and outdoor activity when the index is in this range.

Ratings of 200 to 299 are considered very unhealthful and can produce significant aggravation of symptoms and decreased exercise tolerance in persons with heart or lung disease. A variety of symptoms may occur in healthy persons. Elderly people and those with existing heart or lung problems should stay indoors and reduce physical activity.

An index above 299 is considered hazardous. When an index ranges from 300 to 399, premature onset of certain diseases can be expected in addition to significant aggravation of symptoms and decreased exercise capability in healthy persons. Elderly people and individuals with existing diseases should stay indoors and avoid physical exertion. The general population should avoid outdoor activity when the air quality index exceeds 299.

An index between 400 and 500 can be expected to cause premature death of ill and elderly people. Healthy persons will experience adverse symptoms that affect their normal activity. All persons should remain indoors, keeping windows and doors closed, and everyone should minimize physical exertion and avoid motor vehicle traffic.

An example of an Air Quality Index Report is as follows:

This is the North Carolina Department of Natural Resources and Community Development Air Quality Report.

The air quality index for most of Durham County is 88 for the four-hour period ending at 12 noon. This index is regarded as moderate. The responsible pollutant is ozone.

This report will be updated at 4 pm. Thank you for calling.

TABLE X: North Carolina Ambient Air Monitoring Sites Operating In 1987

COUNTY	SITE	SITE NUMBER	POLLUTANT(S)
Alamance	Burlington	37-001-0001	TSP
Alexander	Taylorsville	37-003-0003	TSP, O_3, SO_2
Beaufort	Aurora	37-013-0003	SO_2
Beaufort	Washington	37-013-0003	TSP
Buncombe	Airport	37-021-0025	TSP
Buncombe	Asheville Health & Welfare Bldg	37-021-0003	TSP, PM-10
Buncombe	Candler	37-021-0027	TSP
Buncombe	Fairview	37-021-0029	O_3
Buncombe	Grove Stone	37-021-0026	TSP
Cabarrus	Kannapolis	37-025-0004	TSP
Caldwell	Lenoir	37-027-0003	TSP, O_3
Carteret	Morehead City	37-031-0003	TSP
Catawba	Hickory	37-035-0004	TSP
Chatham	Moncure	37-037-0003	TSP
Chatham	Moncure	37-037-0098	O_3, SO_2
Columbus	Acme	37-047-0001	TSP, SO_2
Cumberland	Eastover	37-051-0001	O_3
Cumberland	Fayetteville	37-051-0004	TSP, PM-10
Davidson	Lexington	37-057-0002	TSP
Davidson	Thomasville	37-057-1001	TSP
Davie	Fork	37-059-0099	O_3, SO_2
Durham	Durham, Old Sears Bldg	37-063-0001	TSP, PM-10
Durham	Durham, Old Health	37-063-0008	CO
Durham	Durham, Park	37-063-0010	CO
Edgecombe	Leggett	37-065-0099	O_3, SO_2
Edgecombe	Rocky Mount	37-065-0002	TSP
Forsyth	Kernersville	37-067-1001	TSP
Forsyth	Walkertown	37-067-0001	TSP
Forsyth	Belews Creek Rd.	37-067-0006	O_3
Forsyth	Prince Ibraham Sch.	37-067-0004	TSP, O_3
Forsyth	Winston Salem, Fairchild Rd.	37-067-0017	TSP
Forsyth	Winston Salem, Ferguson Sch.	37-067-0007	SO_2, NO_2
Forsyth	Winston Salem, Friends Church	37-067-0021	TSP
Forsyth	Winston Salem, Hanes Park	37-067-0009	TSP
Forsyth	Winston Salem, Hutton St.	37-067-0015	TSP
Forsyth	Winston Salem, Main St.	37-067-0018	CO
Forsyth	Winston Salem, Queen St.	37-067-0019	CO
Forsyth	Winston Salem, Ridge Ave	37-067-0013	TSP
Forsyth	Winston Salem, Silas Creek Pkwy	37-067-0020	TSP
Forsyth	Winston Salem, Stadium Dr.	37-067-0014	TSP, PM-10
Forsyth	Winston Salem, 13th & Hattie St.	37-067-0022	SO_2, NO_2
Gaston	Gastonia	37-071-0014	TSP
Granville	Butner	37-077-0001	O_3
Guilford	Greensboro, Edgeworth & Bellemeade	37-081-0009	TSP, PM-10
Guilford	Greensboro, 409 Friendway Dr.	37-081-0012	TSP
Guilford	Greensboro, Hunter School	37-081-0010	TSP, SO_2
Guilford	High Point, East Green St.	37-081-0004	TSP
Guilford	High Point, English Rd.	37-081-1003	TSP
Guilford	High Point, Hwy Patrol Bldg.	37-081-1005	TSP
Guilford	McLeansville	37-081-0011	O_3
Halifax	Roanoke Rapids	37-083-0002	TSP

(Continued)

TABLE X: Continued

COUNTY	SITE	SITE NUMBER	POLLUTANT(S)
Harnett	Dunn	37-085-0001	TSP
Haywood	Canton	37-087-0002	TSP
Haywood	Hazelwood	37-087-0006	TSP
Henderson	Hendersonville	37-089-0005	TSP
Iredell	Statesville	37-097-0002	TSP
Iredell	Troutman	37-097-0002	TSP, SO_2
Johnston	Micro	37-101-0099	O_3, SO_2
Lenoir	Kinston	37-107-0003	TSP
Lincoln	Iron Station	37-109-0099	O_3, SO_2
Lincoln	Lincolnton	37-109-0002	TSP
Martin	Farmlife	37-117-0099	O_3, SO_2
McDowell	Marion	37-111-0002	TSP
Mecklenburg	Arrowood	37-119-1005	TSP, O_3
Mecklenburg	Cabarrus Co. Line	37-119-1009	O_3
Mecklenburg	Charlotte, Central	37-119-0032	CO
Mecklenburg	Charlotte, City Hall	37-119-0001	TSP
Mecklenburg	Charlotte, Comm. Hosp.	37-119-0002	TSP
Mecklenburg	Charlotte, Co. Health Dept.	37-119-0011	TSP
Mecklenburg	Charlotte, Federal Reserve	37-119-0029	CO
Mecklenburg	Charlotte, Fire Station #10	37-119-0010	TSP, PM-10
Mecklenburg	Charlotte, Fire Station #11	37-119-0003	TSP
Mecklenburg	Charlotte, Greenville Neighbor. Ctr.	37-119-0035	CO
Mecklenburg	Charlotte, 1501 N I-85	37-119-0028	TSP
Mecklenburg	Charlotte, Park Road	37-119-0031	CO
Mecklenburg	Charlotte, Plaza Rd. & Lakedale	37-119-0034	CO, O_3,
Mecklenburg	Charlotte, Woodlawn VFD	37-119-0026	TSP
Mecklenburg	Davidson	37-119-1001	TSP
Mecklenburg	Duke Power	37-119-1006	TSP
Mecklenburg	Huntersville	37-119-1003	TSP
Mecklenburg	Mint Hill	37-119-2001	TSP
Mitchell	Spruce Pine	37-121-0001	TSP
New Hanover	Castle Hayne	37-129-0002	O_3
New Hanover	Wilmington, Walnut & Waters	37-129-1002	TSP
New Hanover	Wilmington, Ninth & Orange	37-129-0005	TSP, PM-10
Onslow	Jacksonville	37-133-0004	TSP
Pasquotank	Elizabeth City	37-139-0001	TSP
Person	Gordonton	37-145-0099	O_3, SO_2
Person	Roxboro	37-145-0001	TSP
Pitt	Farmville	37-147-0099	O_3, SO_2
Pitt	Greenville	37-147-0002	TSP
Randolph	Asheboro	37-151-0003	TSP
Robeson	Lumberton	37-155-0003	TSP
Robeson	St. Pauls	37-155-0099	O_3, SO_2
Rowan	Salisbury	37-159-1005	TSP
Sampson	Clinton	37-163-0002	TSP
Scotland	Laurinburg	37-165-0003	TSP
Surry	Mount Airy	37-171-0002	TSP
Transylvania	Brevard	37-175-0002	TSP
Wake	Raleigh, Effie Green Sch.	37-183-0012	CO
Wake	Raleigh, Person St.	37-183-0011	CO
Wake	Raleigh, North Hills	37-183-0003	TSP, PM-10
Wake	Raleigh, Wilmington St.	37-183-0010	CO
Wake	Wake Forest	37-183-2001	O_3
Washington	Plymouth	37-187-0002	TSP
Wayne	Goldsboro	37-191-0004	TSP
Wilson	Wilson	37-195-0002	TSP

Appendix A

AIR POLLUTION MONITORING AGENCIES

Division of Environmental Management
(All counties except those below)
Air Quality Section
P. O. Box 27687
Raleigh, North Carolina 27611
(919) 733-3340

Western North Carolina Regional Air Pollution Control Agency
(Buncombe & Haywood Counties)
Buncombe County Courthouse Annex
Asheville, North Carolina 28801-3569
(704) 255-5655

Forsyth County Environmental Affairs Department
(Forsyth County)
537 North Spruce Street
Winston-Salem, North Carolina 27101
(919) 727-8064

Mecklenburg County Department of Environmental Protection
(Mecklenburg County)
1200 Blythe Blvd.
Charlotte, North Carolina 28203
(704) 376-4603

Guilford County Department of Environmental Health
(Guilford County)
301 N. Eugene Street
Greensboro, North Carolina 27401
(919) 373-3771

Appendix B

EXCEPTIONAL EVENTS

1. **Natural Events**
   - Sustained high windspeeds (PM)*
   - Stagnations/inversions (all pollutants)
   - Unusual lack of precipitation (PM)
   - Stratospheric ozone intrusion (O_3)
   - Volcanic eruption (CO, SO_2, PM)
   - Forest fires (CO, PM)
   - High pollen count (PM)

2. **Unintentional Man-made Events**
   - Large accidental structural fires (CO, PM)
   - Major traffic congestion due to accident or nonrecurring obstruction (CO)
   - Chemical Spills (SO_2, NO_2, PM, CO)
   - Industrial accidents (SO_2, NO_2, PM, CO)

3. **Intentional Man-made Events**
   - Short-term construction/demolition (PM)
   - Sandblasting (PM)
   - High-sulfur oil refining (SO_2)
   - Roofing operations (PM, SO_2)
   - Salting or sanding of streets (PM)
   - Infrequent large gatherings (PM, CO)
   - Soot blowing from ships (PM)
   - Agricultural tilling (PM)
   - Prescribed burning (CO, PM)
   - Noncompliance--local source (CO, SO_2)

*PM = particulate matter results affected
CO = carbon monoxide results affected
NO_2 = nitrogen dioxide results affected
SO_2 = sulfur dioxide results affected
O_3 = ozone results affected

Appendix C

OZONE EXCEEDANCES IN THE LAST THREE YEARS

SITE NAME / NUMBER	CONC PPM	1986 DATE	NUM EXCD	CONC PPM	1987 DATE	NUM EXCD	CONC PPM	1988 DATE	NUM EXCD	EXCEEDANCE 3-YR TOTAL
STATE AGENCY SITES										
Butner (Durham)	0.127	7-22	1	0.126	7-20	3	0.137	6-22	6	10
37-077-0001 SLAMS				0.126	8-08		0.128	7-07		
				0.125	7-21		0.132	7-09		
							0.128	8-17		
							0.131	8-19		
							0.129	8-26		
Eastover (Fayetteville)			0	0.125	7-21	1	0.131	5-31	3	4
37-051-0001 NAMS							0.130	6-01		
							0.141	6-02		
Farmville (Pitt County)										
37-147-0099SPM	NOT OPERATING			NOT OPERATING			.125	6-08	1	1
Fork (Davie County)	NOT OPERATING			NOT OPERATING			0.126	6-14	7	7
37-059-0099 SPM							0.145	7-07		
							0.153	7-08		
							0.151	7-09		
							0.135	7-10		
							0.125	7-16		
							0.139	8-17		
Iron Station (Lincoln Co.)	NOT OPERATING			NOT OPERATING			0.126	7-07	2	2
37-109-0099 SPM							0.141	7-08		
McLeansville (Greensboro)	0.139	7-22	1			0	0.139	6-08	8	9
37-081-0011 SLAMS							0.132	6-22		
							0.144	7-07		
							0.144	7-08		
							0.131	7-09		
							0.128	7-10		
							0.150	7-16		
							0.144	8-19		
Wake Forest (Raleigh)			0	0.129	8-05	2	0.137	6-01	10	12
37-183-2001 NAMS				0.125	7-20		0.157	6-08		
							0.126	6-13		
							0.125	6-21		
							0.141	6-22		
							0.137	6-23		
							0.142	7-07		
							0.140	7-09		
							0.135	8-18		
							0.159	8-19		
STATE AGENCY TOTALS			2			6			37	45

(Continued)

Appendix C

OZONE EXCEEDANCES IN THE LAST THREE YEARS

SITE NAME/NUMBER	CONC PPM	1986 DATE	NUM EXCD	CONC PPM	1987 DATE	NUM EXCD	CONC PPM	1988 DATE	NUM EXCD	EXCEEDANCE 3-YR TOTAL
LOCAL AGENCY SITES										
Arrowood (Mecklenburg)	0.139	7-14	5	0.151	7-21	4	0.130	6-01	8	17
37-119-1005 SLAMS	0.130	7-16		0.135	7-24		0.149	6-08		
	0.129	7-07		0.131	7-22		0.140	6-13		
	0.126	7-21		0.128	7-25		0.137	6-21		
	0.125	6-25					0.143	7-07		
							0.167	7-08		
							0.125	7-15		
							0.158	8-18		
County Line (Mecklenburg)	0.154	7-28	1	0.138	8-21	1	0.132	6-08	9	11
37-119-1009 NAMS							0.126	6-16		
							0.144	6-17		
							0.127	7-07		
							0.169	7-08		
							0.127	7-09		
							0.156	7-10		
							0.134	8-18		
							0.126	9-14		
Plaza (Mecklenburg)	0.137	7-28	3	0.127	7-20	2	0.169	6-08	7	12
37-119-0034 NAMS	0.131	8-01		0.127	8-05		0.148	6-17		
	0.127	7-07					0.131	6-22		
							0.125	7-07		
							0.158	7-08		
							0.126	7-10		
							0.158	8-18		
Prince Ibraham (Forsyth)			0	0.129	8-21	1	NOT OPERATING		0	1
37-067-0004 SLAMS										
Belews Creek (Forsyth)	0.132	8-01	1	0.129	8-2	1	0.142	6-14	3	5
37-067-0006 SLAMS							0.137	7-07		
							0.128	7-09		
Ferguson School (Forsyth)										
37-067-0007 SLAMS	NOT OPERATING			NOT OPERATING			0.134	6-14	3	3
							0.137	7-07		
							0.134	7-09		
Union Cross (Forsyth)	NOT OPERATING			NOT OPERATING			0.128	7-07	2	2
37-067-1008 SLAMS							0.138	7-08		
LOCAL AGENGY TOTALS			10			9			32	51
ALL STATE TOTALS			12			15			69	96

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